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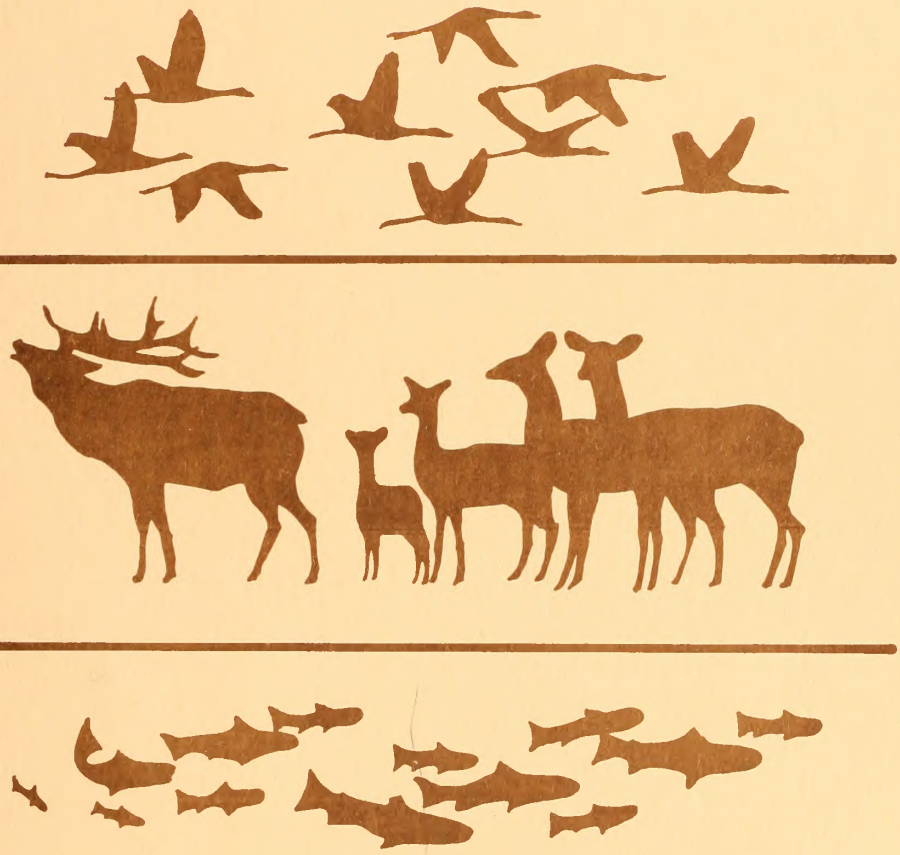

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SECTION 1 - INTRODUCTION

Authority, Purpose and Scope

This report covers approximately 14 months of field and office work. It was prepared in accordance with Interagency Agreement NMSO-74 dated June 16, 1976 and Contract YA-515-1Ab-25 dated September 24, 1976. The inventory was performed by Fish and Wildlife Service personnel of the Albuquerque Field Office for the Bureau of Land Management, Albuquerque District.

The purpose of the inventory was to gather basic fish and wildlife data on the proposed Star Lake-Bisti coal lease area in northwestern New Mexico for use by the Bureau of Land Management in the preparation of a regional environmental statement on the leasing proposal.

The inventory area encompasses approximately 4.8 million acres of public, state, Indian, and private lands. These lands are located generally within an area bounded on the north by the Colorado line, on the east and west by the Jicarilla and Navajo Indian Reservations, and on the south by the town of Grants. The lands considered for leasing total approximately 1.3 million acres scattered throughout the inventory area.

Office work on the inventory consisted of literature search and compilation and preparation of data on mammals, birds, fish and other aquatics, reptiles, amphibians, and arthropods. Where data were available, this work included identification of species/habitat relationships, relative abundance, seasonal occurrence, and delineation of essential or key habitat areas with particular emphasis on Federal and State threatened and endangered species. The field work portion consisted of establishing 16 permanent wildlife transects through representative vegetation types with emphasis on those areas indicated by BLM, Albuquerque District, as probable priority lease areas. Combined length of all transects is estimated at 330 miles, with a coverage of 551 sampling stations. Wildlife habitat mapping was done under contract with Technology Application Center, University of New Mexico, Albuquerque, New Mexico.

Personnel

Five people were assigned full time to the inventory; the Project Leader and four temporary (700-hour) employees. In addition, Mr. Charlie Sanchez, Jr., Fish and Wildlife Service, Ecological Services, Albuquerque Field Office, because of his expertise and

experience with the fisheries and aquatic environments of the area, provided invaluable input and advice on the aquatic portion of the inventory. Inventory team members and their responsibilities were:

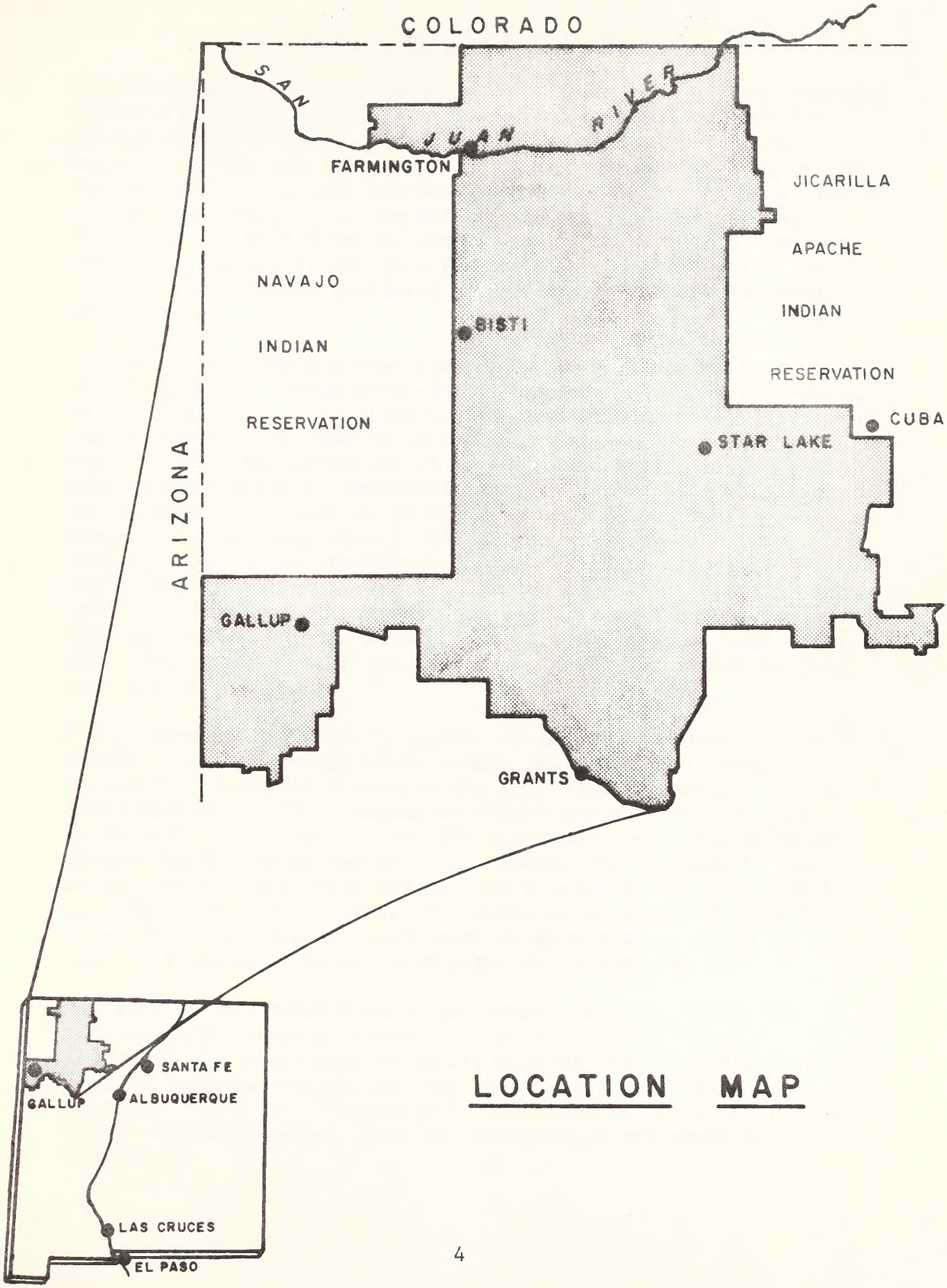
Arthur M. Kinsky	Supervision and Coordination of Inventory, wildlife transects, report preparation
Gordon Venable Biological Technician	Vegetation mapping (FWS employee assigned to assist TAC)
Donna Cole Biological Technician	Wildlife transects, literature search - birds
David Hafner Biological Technician	Wildlife transects, literature search - amphibians, reptiles and mammals
Melanie Dziadulewicz Biological Technician	Wildlife transects, literature search - threatened and endangered species
Charlie Sanchez, Jr.* Fishery Biologist	Aquatics, terrestrial and aquatic arthropods, wildlife transects

Field Inventory Methods

Where possible, transects are established on all weather roads and are, for the most part, laid out to permit running each transect in reverse to provide alternating early morning sampling of each transect particularly on relatively long transects that take 3 to 4 hours to complete. Transects were begun at sunrise each morning beginning at station #1 or the last station (if run in reverse). Starting time, starting mileage, and weather conditions were recorded at the first station. Stations are either one-half or one mile apart depending on the type of habitat sampled, i.e., relatively monotypic habitat such as grassland or diverse habitat such as a pinon-juniper-sagebrush community. Five minute stops were made at each station. Observers spent this time randomly walking each station for the purpose of identifying species by sight (flushing), song/call, tracks, scat, burrows, or other identifying signs, e.g., tail marks of Kangaroo-rat = *Dipodomys* sp. Observations between stations were recorded while traveling at approximately five to ten miles per hour. All observations were recorded on a Lanier "Microsette 60" tape recorder and later transcribed, compiled, and proofed in the office. Field data were combined with species lists derived from literature search. Transect maps and pertinent transect data are contained in Appendix B.

*not a full time member

Because of the size of the area to be covered and the relatively short time involved, no attempt was made to collect data in a manner that would later permit statistical analysis. However, the data are considered empirically reliable, i.e., observers had previous experience in this type of work, the same observers were used throughout the inventory, and the field data combined with the data derived from literature search (often from statistically reliable surveys) are considered to have produced a final product that is reliable to the extent that the available source data are reliable. A bibliography of the source data used in the literature search portion of the inventory is contained in Appendix A.



LOCATION MAP

SECTION 2 - DESCRIPTION OF THE AREA

The inventory area is an irregularly shaped tract of land covering almost 4.8 million acres in northwestern New Mexico. The area extends about 130 miles from north to south (Colorado line to Grants, New Mexico) and about 105 miles from east to west at the widest point (from near Torreon, New Mexico to the Arizona line). At the north end, it is bounded on the east and west by the Jicarilla and Navajo Indian reservations, respectively. Most of the area lies within San Juan and McKinley Counties, with the eastern edge located partially within Rio Arriba and Sandoval Counties.

Located within the San Juan Basin, the area is dominated by the grassland/desert shrub/pinon-juniper vegetation types so typical of the Southwest. Elevation varies from approximately 5,100 feet near Fruitland, New Mexico to slightly over 11,000 feet at Mt. Taylor. With the exception of the San Juan River drainage, the area has virtually no dependable surface water. The only significant farming activities in the area occur along the San Juan, Animas, and La Plata Rivers, and in the vicinity of Gallup, Grants, Cuba and on the Navajo Indian Irrigation Project, located south of Farmington. Livestock grazing is a major activity on the area and, more recently, there has been increasing interest in the exploration for and development of coal, uranium, and natural gas. The population of the area is currently estimated at just over 161,000 people.

The climate of the area is typical of the southwestern United States. Annual precipitation ranges from about 12 inches in the vicinity of Zuni and Grants on the south end, to about 7 inches at Fruitland and 8 and 10 inches at Bloomfield and Aztec at the north end. As is typical for the Southwest, peak precipitation occurs during the months of July, August, and September. However, these averages are deceiving in that precipitation is extremely variable from year to year. For example, 66 years of data from Aztec Ruins National Monument show a range from 3 inches to 24 inches of measured annual precipitation at that station.

For such an extremely large area, there are surprisingly no extreme differences in average seasonal temperatures. Certain locations may experience unusually high or low temperatures, but overall seasonal variations over most of the area vary only slightly. This is illustrated by data from stations located at Grants and Farmington. Data for Albuquerque are shown for comparison.

AVERAGE SEASONAL TEMPERATURES (^{o}F)

SEASON	LOCATION		
	Grants	Farmington	Albuquerque
Dec-Feb	29	28	35
Mar-May	51	50	55
Jun-Aug	69	72	76
Sep-Nov	50	51	55

SECTION 3 - VEGETATION

Vegetation of the inventory area was delineated into five broad habitat types which, for the most part, support distinct wildlife species. The types include Grassland/Desert Shrub/Barren, Pinon-Juniper Woodland, Ponderosa Forest, Spruce-Fir Forest, and Riparian. Vegetation maps depicting habitat types are contained in Appendix C.

Grassland/Desert Shrub/Barren

This habitat type covers the largest geographic area within the inventory area. Soils are typically sandy and large barren areas are not uncommon. Much of it has been severely overgrazed by livestock.

The landscape varies from low rolling hills and sandy ridges to large relatively flat expanses crossed by numerous dry washes and arroyos. The view across some of the flatter areas is often unobstructed for several miles.

Dominant plant species within this habitat type include green jointfir (*Ephedra viridis*) at higher elevations, with rubber rabbitbrush (*Chrysothamnus nauseosus*), greasewood (*Sarcobatus vermiculatus*), and pale wolfberry (*Lycium pallidum*) typically found along the dry washes and arroyos. Depending on the environmental characteristics of a particular area, four-wing saltbush (*Atriplex canescens*) and snakeweed (*Gutierrezia sarothrae*) may be locally abundant and appear as almost pure stands. Typical grasses include galleta (*Hilaria jamesii*), blue grama (*Bouteloua gracilis*), sand dropseed (*Sporobolus cryptandrus*), and Indian ricegrass (*Oryzopsis hymenoides*). On overgrazed areas, Russian thistle (*Salsola kali*) and cheat grass (*Bromus tectorum*) are more common. A large portion of the type in the northern half of the inventory area is dominated by big sagebrush (*Artemisia tridentata*). The severely overgrazed areas within this habitat type have low to negligible wildlife value. Areas not so severely affected support a diversity of bird and mammal species, particularly xeric-adapted rodents.

Pinon-Juniper Woodland

This habitat type occurs throughout the inventory area. Typical tree and shrub species include pinon pine (*Pinus edulis*), juniper (*Juniperus sp.*), big sagebrush, Utah serviceberry (*Amelanchier utahensis*), oak (*Quercus sp.*), four-wing saltbush, antelope bitterbrush (*Purshia tridentata*), mountain-mahogany (*Cercocarpus montanus*), and cliffrose (*Cowania mexicana*). As elevation decreases,

yucca (Yucca sp.) becomes more abundant. Some of the more important grasses include blue grama and wheat grass (Agropyron sp.), galleta, alkali-sacaton (Sporobolus airoides), Indian rice grass and sandhill muhly (Muhlenbergia pungens). Some of the common forbs found in the types are aster (Aster hirtifolius), goosefoot (Chenopodium Freemontii), buckwheat (Eriogonum sp.), fleabane (Erigeron superbus), lupine (Lupinus kingii), groundsel (Senecio longilobus), and goldenrod (Solidago Retradoria).

Ponderosa Forest

The type is limited to small geographic areas within the inventory area. It is most commonly found between 8,000 to 9,000 feet and is restricted mainly to the Mt. Taylor area, the Zuni Mountains and small scattered stands along the extreme northeast boundary of the inventory area. Pure stands are, in the most cases, practically devoid of any conspicuous understory and are used by relatively few but important species of birds and mammals such as turkey and elk which are not restricted to the type but are typically found in it. Mixed stands in which ponderosa pine (Pinus ponderosa) is still the principal overstory may contain spruce (Picea sp.), fir (Abies sp. and Pseudotsuga menziesii), pine (Pinus sp.), juniper (Juniperus sp.), aspen (Populus tremuloides), and oak (Quercus sp.).

Principal grass species found in the type are blue grama (Bouteloua gracilis), mountain muhly (Muhlenbergia montana), Arizona fescue (Festuca arizonica), mutton bluegrass (Poa Fendleriana), june grass (Koeleria cristata), squirrel-tail (Sitanion Hystrix), pine dropseed (Blepharoneuron tricholepis), and western wheat grass (Agropyron Smithii).

The major shrubs in the type are serviceberry (Amelanchier utahensis), squaw currant (Ribes inebrians) and skunkbush (Rhus trilobata).

The most common forbs found in the type are bladderpod (Lesquerella sp.), bitterweed (Hymenoxys Richardsoni), Lupine (Lupinus sp.), snakeweed, and beardtongues (Penstemon Jamesii and P. barbatus).

Riparian

This habitat type is limited almost exclusively to the San Juan River drainage and small streams and lakes in the Mt. Taylor area. However, during wet periods the type may be found in association with several ephemeral streams and ponds throughout the area. In general, most of the vegetation within the type must live in or near water to survive and reproduce.

Vegetation along the banks of the San Juan River and other permanent streams is generally comprised of low growing plants forming a band from only a few feet wide to relatively broad, marshy areas. Typical plants include jointed horsetail (Equisetum sp.), spikerush (Eleocharis sp.), cattail, (Typha latifolia), sedge (Carex sp.), bulrush (Scirpus sp.), and other hydrophilic species. Kentucky bluegrass (Poa pratensis), cocklebur (Xanthium sp.), and coyote willow (Salix exigua) are also commonly found in the habitat type. If soils are alkaline, willow is replaced by salt cedar (Tamarix pentandra). Rio Grande cottonwood (Populus wislizenii), Russian olive (Eleagnus augustifolius) and scattered stands of peachleaf willow (Salix amygdaloides) and Pacific willow (Salix lasiandra) are also characteristic of this type in a few areas.

Depending on elevation, soils, and moisture, other species which may occur in the type include New Mexico olive (Forestiera neomexicana), skunkbush (Rhus trilobata), greasewood (Sarcobatus sp.), rubber rabbitbrush, and occasionally rose (Rosa sp.). The bottoms of large arroyos have similar vegetation but may also support narrowleaf cottonwood (Populus angustifolia) and box elder (Acer negundo).

Grasses, forbs and other groundcover species vary but typical representatives are Kentucky bluegrass, foxtail barley (Hordeum jubatum), streambank wheatgrass (Agropyron riparium), Canada wildrye (Elymus canadensis), asters (Aster sp.), Russian thistle (Salsola Kali), sunflower (Helianthus sp.), beeplant (Cleome sp.), Virginia creeper (Parthenocissus vitacea), and virginbower (Clematis ligusticifolia). Although much of the lands adjacent to the San Juan have been converted to cropland, they are considered an important part of the type. Numerous wildlife species, particularly birds, depend on these agricultural areas for food, cover, and reproduction. The most extensively grown crops are alfalfa and corn. Other crops of importance include fruit trees, small grains, vegetables and potatoes. The weedy areas around these fields also provide important nesting and escape cover.

Spruce-Fir Forest

This habitat type is limited primarily to the Mt. Taylor area and small stands located around the upper end of Navajo Reservoir. At lower elevations, it is co-mingled with the ponderosa type. Typical tree species include Douglas-fir (Pseudotsuga menziesii), blue spruce (Picea pungens), corkbark fir (Abies lasiocarpa var. arizonica), Engelmann spruce (Picea Engelmanni), and aspen. Other important species are bluegrasses (Poa Fendleriana, P. interior), oat grass (Danthonia californica), and fescue (Festuca arizonica, and Gamble's oak (Quercus Gambelii).

SECTION 4 - MAMMALS

Mammal species occurring in the inventory area are usually found in association with particular preferred habitats. However, they are not restricted to them. For various reasons such as seasonal migration, daily needs for feeding, cover, etc., they utilize other habitats. Accordingly, whenever possible only the preferred species/habitat association is given. Those species occurring throughout the inventory area which are not particularly dependent on a specific habitat type are discussed as being associated with the habitat they most prefer. Species are grouped and discussed by order. Table 1 lists species that have been observed or are known to occur in the inventory area and also gives the habitats with which they are most typically associated.

Chiroptera (bats)

Most representatives of this order are restricted to either permanent water or to higher elevation habitat types such as ponderosa pine forest. Several species are infrequently found in desert grassland. Two resident species, the western pipistrel (*Pipistrellus hesperus*) and the pallid bat (*Antrozous pallidus*) prefer grassland habitat. Both of these species are highly adapted to xeric conditions, and both (especially the western pipistrel) are most commonly found near rocky cliffs.

Most species roost and rear their young in caves, mines, bridges, or manmade structures while the silver-haired bat (*Lasionycteris noctivagans*) and hoary bat (*Lasiurus cinereus*) are primarily tree roosters. A total of 16 bat species are considered to inhabit the inventory area. The resident or hibernating species (12 species) are generally active from May through October. The migrating species (four species) are most abundant from April through October. Migrants include the silver-haired bat, hoary bat, Mexican free-tailed bat (*Tadarida brasiliensis*), and the big free-tailed bat (*Tadarida molossa*). During migration, these species may be found outside their preferred habitat, but only as transients. Resident species may undergo altitudinal migrations, ranging into higher elevations during the summer.

The spotted bat (*Euderma maculata*), although reported from Aztec, San Juan County, New Mexico (Rodeck, 1961) is apparently not commonly found in the area. This record is possibly that of an animal "en-route to winter quarters" (Findley, et al., 1975); however, the possibility that the species roosts within the area should not be dismissed. The species has also been taken in Rio Arriba and Sandoval Counties in pinon-juniper woodland and ponderosa forest in the

vicinity of rock and sandstone cliffs and streams and ponds. These habitat types are at least conspicuous on the area and, pinon-juniper in particular, is common. It is therefore highly credible that the species may be more common to the area than previously thought. Handley (1959) believes the species may use caves in the area for hibernation.

Detailed information relative to habitat, food habits and refugia (roosting or hibernation sites and preferences) can be found in Findley, et al., (1975).

Insectivora (shrews)

The literature indicates that there are probably only two species of insectivores occurring in the lease area: the desert shrew (*Notiosorex crawfordi*), and the vagrant shrew (*Sorex vagrans*).

The desert shrew is "confined to arid regions in New Mexico (Findley, et al., 1975). Although the closest record for this species is from the east base of the volcanic plateau surrounding Mt. Taylor (Bailey, 1932), Findley (op. cit.) believes the desert shrew to be more common than is indicated by the numbers of specimens collected. Suitable habitat occurs practically throughout the lease area; accordingly, the species is almost certainly widespread, although possibly low in number.

The vagrant shrew is fairly common in mesic areas near water in the ponderosa pine zone. Actual records are from the north slope of the Zuni Mountains and from Mt. Taylor.

Lagomorpha (hares and rabbits)

In addition to the ubiquitous black-tailed jackrabbit, (*Lepus californicus*), the order is represented by three species of cottontail rabbits (*Sylvilagus sp.*) within the inventory area. Although the taxonomic validity of these species is doubted (Findley, et al, 1975, and Harris, 1963), the three are distinguishable and ecologically allopatric. The desert cottontail (*Sylvilagus auduboni*) is by far the most widespread, inhabiting pinon-juniper woodland and lower vegetation zones. At the northern end of the inventory area, near Pine River, Nuttall's cottontail (*Sylvilagus nuttalli*) inhabits riparian situations (Harris, 1963). In the southern mountain ranges (the Zuni's and Mt. Taylor), the eastern cottontail (*Sylvilagus floridanus*) is found from mid-elevation and higher woodland especially in ponderosa pine forest and above.

The black-tailed jackrabbit is found occasionally in open ponderosa pine forest but it is by far more common in and prefers desert-grassland situations.

Rodentia (mice, squirrels, and allies)

Thirty-three species of rodents occur in the inventory area. Because their home ranges are relatively small, they are restricted to specific habitat types more so than the larger, more mobile mammal species.

Three species are restricted to areas of permanent water: the beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), and meadow vole (*Microtus pennsylvanicus*). Other species inhabiting riparian areas are found in all of the designated vegetative types. Several species, such as the house mouse (*Mus musculus*), in particular, easily adapt to or prefer human habitation.

By 1910, beavers were seriously reduced or exterminated by trapping in most river drainages in New Mexico, but were restocked between 1947 and 1958 by the New Mexico Department of Game and Fish (Berghofer, 1967). Beaver are now common in the San Juan drainage. Both Hall (1946) and Bailey (1932) have noted the great benefits derived from this species as related to proper watershed management. Since 1953, regulated harvest, to keep populations at an optimal levels, has been permitted. (Findley, et al, 1975).

Xeric adapted rodents such as pocket mice (*Perognathus sp.*), kangaroo rats (*Dipodomys sp.*) and desert ground squirrels (*Ammospermophilus sp.*) are typically found in the grassland/desert shrub habitat type. Species such as the pocket mouse and antelope ground squirrel are also found along the sparsely vegetated transitional edge of pinon-juniper woodland. Some species such as Gunnison's prairie dog (*Cynomys gunnisoni*) may extend their ranges up to the clearings and meadows of ponderosa pine forests.

Common residents of the ponderosa community include northern grasshopper mice (*Onychomys leucogaster*) and the deer mouse (*Peromyscus maniculatus*) which also occur in pinon-juniper woodland. Examples of species that are considered habitat generalists are Botta's pocket gopher (*Thomomys bottae*) and the pinon mouse (*Peromyscus truei*).

The pinon-juniper habitat association, found commonly over the study area, includes a diversity of white-footed mice (*Peromyscus sp.*) and wood rats (*Neotoma sp.*), as well as species noted for the lower desert grassland and the habitat generalists. Of the white-footed mice, the pinon mouse is the most abundant species inhabiting the pinon-juniper type. The brush mouse (*Peromyscus boylei*) replaces it where pinon

gives way to oak or other decidious shrubs become common (Wilson, 1968). Rock piles at the foot of cliff faces in this zone are occupied by the canyon mouse, (Peromyscus crinitus) (Harris, 1963), while the rock mouse (Peromyscus difficilis) occurs in association with accumulations of large rocks or boulders along the southern edge of the San Juan-Chaco Basin. The white-throated woodrat (Neotoma albigula) is the most abundant woodrat in this zone, although it is replaced by the Mexican woodrat (Neotoma mexicana) at higher elevation within the zone. The bushy-tailed woodrat (Neotoma cinerea) and Stephen's woodrat (Neotoma stephensi) are also found in the pinon-juniper type, but they generally prefer the bases of sandstone cliffs, rock outcrops, and rock accumulations, respectively (Hoffmeister and de la Torre, 1960); Harris, 1963). The Mexican and bush-tailed woodrats are typically more common to the ponderosa pine zone.

On the southern edge of the San Juan-Chaco Basin, the cliff chipmunk (Eutamias dorsalis) occupies pinon-juniper woodland and may extend into higher elevations where no congener (member of the same genus) is present. Although more abundant in ponderosa, the Colorado chipmunk (Eutamias quadrivittatus), also inhabits the lower portions of the pinon-juniper zone within the basin.

The porcupine (Erethizon dorsatum) may be found in all habitat types, but is most abundant in ponderosa forest. Also typical of the ponderosa type are the northern pocket gopher (Thomomys talpoides), and two species of tree squirrels, Abert's squirrel (Sciurus aberti), which is essentially restricted to ponderosa forest (Findley, et al, 1975) and found in the Zuni and Taylor Mountain regions; and the red squirrel (Tamiasciurus hudsonicus), found only on Mt. Taylor at and above the upper limits of the ponderosa pine belt (Shroeder, 1961).

The ponderosa type also supports three species of voles or meadow mice: the mountain vole (Microtus montanus), the Mexican vole (Microtus mexicanus), and the long-tailed vole (Microtus longicaudus). Within the inventory area, the mountain vole is found only near the upper Pine River. The Mexican and long-tailed voles are found only in the Zuni Mountains and on Mt. Taylor, in meadows or edges of the higher montane forests. The Mexican vole inhabits grasslands in ponderosa and mixed coniferous forests, and often occurs in pinon-juniper woodland in years of abundance (Findley, op cit).

Carnivora (coyotes, foxes, raccoons, and allies)

Carnivores inhabiting the inventory area are best arranged into three groups: (1) those found primarily in desert grassland and lower pinon-juniper woodland; (2) species closely tied to the San Juan River drainage; and (3) carnivores probably found only in the Zuni Mountains and Mt. Taylor area.

The coyote (Canis latrans) is, by far, the most common and ubiquitous carnivore within the area; it is particularly common in desert grassland habitat. Equally widespread, but in lower densities, are the badger (Taxidea taxus) and bobcat (Lynx rufus). Badgers are possibly more common in desert grassland than in other habitat types due to the abundance of rodents and the friable soils associated with the type. The kit fox (Vulpes macrotis), prefers and is more restricted to the desert grassland community. The bobcat, however, seems to prefer rocky, brushy aspects within the grassland type, as do the gray fox (Urocyon cinereoargenteus) and spotted skunk (Spilogale putorius). The striped skunk (Mephitis mephitis), while found in all habitat types, and common in agricultural areas, is more abundant in open, grassy areas and open woodland habitat. The long-tailed weasel (Mustela frenata) is found in a great variety of habitats, but appears to prefer pinon-juniper. The black-footed ferret, though probably never common in the area (Findley, et al, 1975), is almost exclusively a grassland species. (See Section 9 - Endangered and Threatened Species). The mink (Mustela vison) is closely tied to permanent water of the San Juan drainage. The red fox (Vulpes vulpes) and raccoon (Procyon lotor), although commonly found in riparian habitats near permanent water, are also found away from these areas. The red fox has been recorded in the pinon-juniper woodland of Largo Canyon, and raccoons have been seen in desert grassland, often far from natural water (Findley, et al., 1975).

The black bear (Ursus americanus) and mountain lion (Felis concolor) are present in the montane forests and broken country (respectively) of the Zuni Mountains and Mt. Taylor. Mountain lions may also be present at higher elevations near Pine River Canyon. There are old records of a black bear and a lion from the San Juan Valley, (Lee, 1967). A recent sighting of a mountain lion was reported in the Chaco Canyon National Monument area by Park Service personnel. Ring-tailed cats (Bassariscus astutus) may occur in the brushy, rocky areas near Mt. Taylor. The species has been recorded from southwest of Grants, New Mexico.

Artiodactyla (elk, deer, pronghorn)

Within the inventory area the order is represented by four species; elk (Cervus canadensis, mule deer (Odocoileus hemionus), pronghorn (Antilocapra americana), and Barbary sheep (Ammotragus lervia).

By 1900, elk were considered extirpated throughout New Mexico. Subsequent efforts by the New Mexico Department of Game and Fish have reestablished the species throughout most of their former range. Although one of the State's most important game animals, they were never, and are not now, plentiful on the inventory area. Typically, they prefer the high mountain meadows and woodlands usually found

in association with the ponderosa and spruce-fir habitat types. When deep snows cover available food supplies they will move to lower elevations, usually into pinon-juniper woodlands.

Due to fairly narrow habitat requirements, their distribution on the inventory area is limited to the high country of the upper San Juan River, Rio Arriba County and the forest and woodland areas on and to the northeast of Mt. Taylor and La Ventana Mesa.

The San Juan herd is a wintering herd which moves into the area when deep snows force them out of the San Juan Mountains of Colorado. Accordingly, their presence and number of animals in the area will vary with weather conditions. It is unlikely that any calving occurs on this area.

The Mt. Taylor herd has been estimated at between 60 to 80 animals (Raught, Personal Communication, 1977). During winter, this herd moves northeast to the mesa-woodland habitat of the Ignacio Chavez Grant. In addition, Mesa Chivato of the Ignacio Chavez Grant is estimated to support a permanent herd of 15-20 animals (Bureau of Land Management, 1977). These woodland ecotone areas are considered principal wintering range for both the Mt. Taylor herd and the static Mesa Chivato herd. The location of calving ground in these areas is presently unknown (BLM, 1977).

The La Ventana herd is principally a wintering herd which moves into the area from the Nacimiento Mountains to the mesas and foothills of the La Ventana area. The herd is estimated to number between 50-60 animals. As with the San Juan herd, it is doubtful that any calving occurs on this area.

Mule deer (Odocoileus hemionus) are widely distributed throughout the inventory area where ponderosa pine and pinon-juniper habitat predominate. Being more adaptable than other species such as elk, they do, however, range through all elevations and habitats (Findley, op cit).

Although they generally range throughout the inventory area, heaviest deer concentrations occur in the southeastern section of the area on the Ignacio Chavez Grant, La Ventana area, along the Continental Divide, Mesa San Luis, and Mt. Taylor. With the exception of the Mt. Taylor deer herd, the above areas support an estimated 750 deer throughout the year and approximately 1,150 deer during the winter season (BLM, 1977).

The La Ventana, Ignacio Chavez, and Continental Divide areas are considered principal wintering grounds. These key wintering areas are thought to be essential to the reproductive success of the animals utilizing them. With the exception of Chaco Canyon National

Monument and a relatively small area northeast of Whitehorse, New Mexico, there are no significant deer populations in the central portion of the inventory area. The area is mostly open grassland which has been subjected to long-term and severe overgrazing to the extent that, even if retired from grazing, it may never rehabilitate.

Habitat conditions and deer populations improve markedly on the northern portion of the inventory area. Most of the pinon-juniper habitat north and east of State Highway 17 supports both resident and wintering deer herds. The Rosa, Smith and Gomez Areas, in particular, support the greatest number of wintering deer and show the highest annual browse utilization (BLM, 1976). For example, 1973-74 pellet group transect data for the Rosa area showed 21 and 33 deer/section, respectively. Although this will vary widely depending on habitat conditions during a particular year, it does point up the importance of such areas to maintenance of the herd. National resource lands along the San Juan, La Plata and Animas Rivers supports year-round resident herds. These riparian areas have essentially been withdrawn from any livestock grazing, thus supporting good habitat for deer and other wildlife species.

Once abundant in open grassland habitat throughout New Mexico, the pronghorn or antelope has since suffered a significant reduction in numbers, particularly within the inventory area. In an effort to reestablish the species, the New Mexico Department of Game and Fish transplanted 722 antelope throughout the inventory area between 1937 and 1967. It is generally agreed that, for largely unknown reasons, these attempts were, for the most part, unsuccessful.

An estimated 75 antelope are distributed over the grassland/desert shrub habitat of Ojo del Espiritu Santo Grant east of Cabezon Peak (50 head) and in the vicinity of Eagle Mesa (25 head) 16 miles southwest of Cuba, New Mexico. A small herd has been frequently sighted south of Chaco National Monument and another remnant herd has been observed ranging southeast of the Bisti-Badlands. Another herd estimated at 25 animals has been observed in the vicinity of Counselor Mesa and a small herd of 14 are frequently seen northeast of State Highway 44 between Bloomfield and Huerfano. In an area comprising approximately the northern one-third of the inventory area, the New Mexico Department of Game and Fish, during a recent aerial survey, counted 82 animals. This aerial count is probably more accurate than the numbers noted above for approximately the same area; because of their preference for open country, antelope are highly visible from the air, and Department personnel are experienced in aerial censusing and know, also from experience, where to look for antelope. At any rate, antelope within the inventory area have not fared well despite repeated attempts to reestablish the species to historical ranges. Although the reasons

for the decline in numbers cannot, for the most part, be identified any proposal for relief from livestock grazing can surely do no further harm.

In 1956, 21 Barbary sheep were released by the San Juan County Wildlife Federation in the Largo Canyon area of San Juan County (New Mexico Wildlife Management, 1967). Although a remnant population still survives in the area, the species has not done well. The Barbary is native to North Africa and apparently has not been able to adapt to the Largo Canyon area because of the absence of specific but as yet unidentified habitat requirements. The remaining animals do, however, utilize native vegetation and probably owe their survival to the rough terrain of the area which they utilize for escape and resting.

Habitat/species relationships for mammals observed or known to occur on the inventory area are contained in Table 1. The approximate ranges for elk, deer, antelope and prairie dogs are depicted on the species distribution map on page 21.

Table 1. Species/habitat relationships for mammals observed or known to occur in the inventory area

ORDER - COMMON NAME	SCIENTIFIC NAME	HABITAT TYPE 1/ R	G/DS	P/J	P
Insectivora:					
Vagrant shrew	Sorex vagrans				X
Desert shrew	Notiosorex crawfordi		X	X	
Chiroptera:					
Yuma myotis	Myotis yumanensis	X	X	X	
Little brown myotis	Myotis lucifugus	X	X	X	X
Long-eared myotis	Myotis evotis				X
Fringed myotis	Myotis thysanodes	X	X	X	X
Long-legged myotis	Myotis volans	X	X	X	XX
California myotis	Myotis californicus	X	X	X	X
Small-footed myotis	Myotis subulatus	X	X	X	XX
Silver-haired bat	Lasionycteris noctivagans	X	X	X	XX
Western pipistrel	Pipistrellus hesperus	X	XX	X	X
Big brown bat	Eptesicus fuscus	X		X	XX
Hoary bat	Lasiurus cinereus	X		X	X
Spotted bat	Euderma maculata			X	X
Townsend's big-eared bat	Plecotus townsendi	X	X	X	X
Pallid bat	Antrozous pallidus	X	XX	X	X
Mexican free-tailed bat	Tadarida brasiliensis	X	X	X	
Big free-tailed bat	Tadarida molossa	X	X	X	
Lagomorpha:					
#Desert cottontail rabbit	Sylvilagus auduboni	X	X	X	
Eastern cottontail rabbit	Sylvilagus floridanus			X	XX
#Nuttall's cottontail rabbit	Sylvilagus nuttali	X			
#Blacktail jackrabbit	Lepus californicus	X	XX	X	X

1/ R - Riparian
G/DS - Grassland/Desert Shrub
P/J - Pinon-Juniper
P - Ponderosa

* re-introduced
** introduced
*** possibly extinct
\# observed on transects

xx - preferred habitat

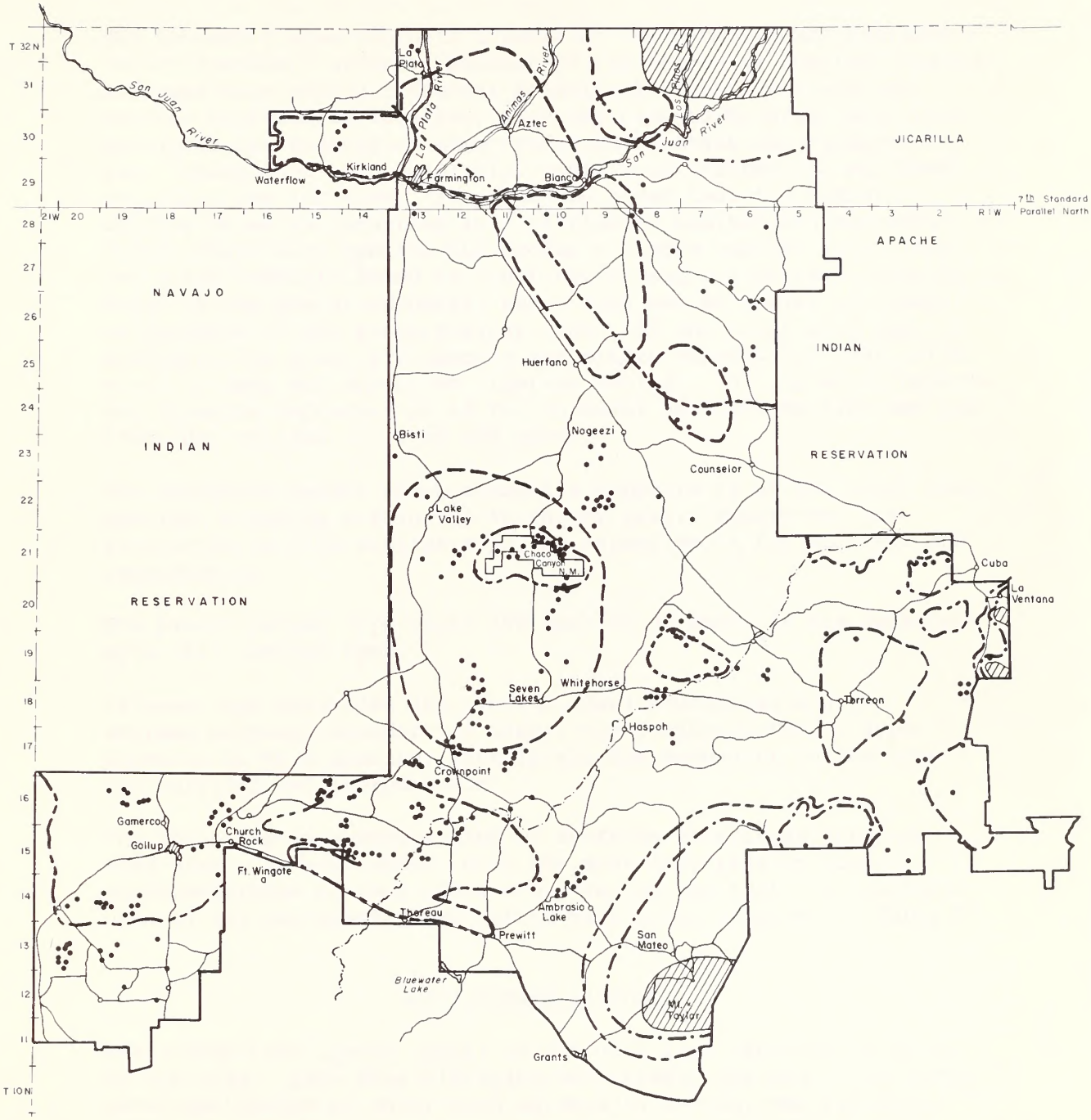
Table 1. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HABITAT TYPE 1/ R	G/DS	P/J	P
Rodentia:					
#Cliff chipmunk	Eutamias dorsalis			XX	X
#Colorado chipmunk	Eutamias quadrivittatus			X	XX
#White-tailed antelope ground squirrel	Ammospermophilus leucurus		XX	X	
#Spotted ground squirrel	Citellus spilosoma		X		
#Rock squirrel	Citellus variegatus	X	X	X	X
#Gunnison's prairie dog	Cynomys gunnisoni	X	XX	X	X
Abert's squirrel	Sciurus aberti				X
Red squirrel	Tamiasciurus hudsonicus				X
Botta's pocket gopher	Thomomys bottae	X	X	X	X
Northern pocket gopher	Thomomys talpoides				X
#Silky pocket mouse	Perognathus flavus		XX	X	
Plains pocket mouse	Perognathus flavescens		XX	X	
#Ord's kangaroo rat	Dipodomys ordi		XX	X	
#Banner-tailed kangaroo rat	Dipodomys spectabilis		X		
#*Beaver	Castor canadensis	X			
Western harvest mouse	Reithrodontomys megalotis	X	X	X	X
Canyon mouse	Peromyscus crinitus			X	
Deer mouse	Peromyscus maniculatus	X	X	X	X
Brush mouse	Peromyscus boylei			X	
Pinon mouse	Peromyscus truei		X	XX	
Rock mouse	Peromyscus difficilis			X	
Northern grasshopper mouse	Onychomys leucogaster		XX	X	
White-throated woodrat	Neotoma albigula		X	X	X
Stephen's woodrat	Neotoma stephensi			X	
Mexican woodrat	Neotoma mexicana			X	XX
Bushy-tailed woodrat	Neotoma cinerea			X	XX
Meadow vole	Microtus pennsylvanicus	X			
Mountain vole	Microtus montanus				X
Mexican vole	Microtus mexicanus			X	XX
Long-tailed vole	Microtus longicaudus				X

Table 1. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HABITAT TYPE 1/ R	G/DS	P/J	P
Rodentia (cont)					
#Muskrat	Ondatra zibethica	X			
**House mouse	Mus musculus	X	X		
#Porcupine	Erethizon dorsatum	X	X	X	X
Carnivora:					
#Coyote	Canis latrans	X	XX	X	X
Red fox	Vulpes vulpes	X	X	X	
Kit fox	Vulpes macrotis		X		
Gray fox	Urocyon cinereoargenteus	X	X	XX	X
Black bear	Ursus americanus	X		X	XX
Ring-tailed cat	Bassariscus astutus		X	X	
#Raccoon	Procyon lotor	XX	X	X	X
Long-tailed weasel	Mustela frenata	X	X	X	X
***Black-footed ferret	Mustela nigripes	X	X	X	X
Mink	Mustela vison	X			
#Badger	Taxidea taxus	X	X	X	X
Western spotted skunk	Spilogale putorius	X	X	X	X
Striped skunk	Mephitis mephitis	X	X	X	X
Mountain lion	Felis concolor	X		X	X
#Bobcat	Lynx rufus	X	X	X	X
Artiodactyla:					
Elk	Cervus canadensis			X	X
#Mule deer	Odocoileus hemionus	X	X	X	X
#Pronghorn antelope	Antilocapra americana		X		
**Barbary sheep	Ammotragus lervia			X	

SPECIES DISTRIBUTION MAP



LEGEND

- ANTELOPE RANGE
- ELK RANGE
- PREFERRED HABITAT
- DEER RANGE
- PRAIRIE DOG TOWNS

SECTION 5 - BIRDS

The inventory area supports a total of 282 bird species representing 23 taxonomic orders. Because of the number of species, orders, and sometimes widely different behavioral characteristics and habitat preferences involved, they are grouped by order and, when possible, are associated with preferred habitats and seasons of use. Where data were available, additional information on breeding, etc. are included. It should be noted that the numbers of species shown as occurring in a particular habitat are not additive. While many species may prefer a single habitat type, they are often commonly found in other types, e.g.; a species commonly found in the grassland/desert shrub type may be almost as common an occupant of the pinon-juniper type. Of the total bird species utilizing the area, 178 species are either essentially restricted to or in some way depend on riparian habitat. Ninety-seven species are directly dependent on it for survival and reproduction and the remainder utilize its food and water.

The grassland/desert shrub community supports 79 of the total bird species occurring within the inventory area. Twenty-two are restricted to this habitat type and depend on it for survival and reproduction.

The pinon-juniper type hosts 108 species of which 14 are dependent upon this habitat type.

Although not extensive (Mt. Taylor, Zuni Mountains, and the extreme northern boundary of area), the ponderosa forest type supports 92 bird species, with 16 species dependent on the type for survival and reproduction.

The following is a description of avifauna inhabiting the inventory area. In most cases, only the most important or common representatives of each order are given in the text. A complete list of all representatives within each order is given in Table 2.

Gaviiformes (loons)

The common loon (*Gavia immer*) is the only loon reported to occur in the area. Like many migrating waterbirds, the loon uses large, permanent bodies of water such as Navajo, Morgan, and Bluewater Lakes, as resting areas en route to southern wintering grounds. Loons are recorded as only casual or occasional visitors to the area during winter and migration periods. They are usually observed as single individuals and remain in the area for short periods of time.

Podicipediformes (grebes)

Of the four species of grebes occurring in the area, only the eared grebe (Podiceps caspicus), and pied-billed grebe (Podilymbus podiceps) are known to breed in the San Juan Basin. The other two species, the western grebe (Aechmophorus occidentalis) and horned grebe (Podiceps auritus) are rare winter visitors reported as casual migrants through the area and are usually found on small and large open bodies of water.

The two species known to breed in the area are uncommon to fairly common year-round residents in the San Juan Valley, but considered casual to rare elsewhere on the area.

Pelecaniformes (pelicans and cormorants)

Both the white pelican (Pelecanus erythrorhynchos) and the double-crested cormorant (Phalacrocorax auritus) appear in the area as only casual to rare migrants usually on large open bodies of water. The pelican has been reported near Grants and in the San Juan Valley area.

Ciconiiformes (herons and allies)

All of these wading birds are restricted to riparian habitats with several species directly associated with marshlands within the type. However, there are few suitable marsh areas remaining in the riparian habitats of northwestern New Mexico, therefore these birds tend to be present in low numbers. In addition, these birds are largely secretive and may be easily overlooked.

Of the eight species known to occur in the area, breeding evidence for two species has been recorded in the San Juan River Basin. These are the great blue heron (Ardea herodias) and the American bittern (Botaurus lentiginosus). Although the great blue heron typically nests in large rookeries with many breeding pairs, rookeries of this type are not known in the San Juan Basin. The American bittern breeds in dense marshes in the valley, but has become increasingly rare.

Three other species, the green heron (Butroides virescens), black-crowned night heron (Nycticorax nycticorax), and least bittern (Ixobrychus exilis), are common residents of the San Juan Basin. It is possible that these birds breed in the valley but definite evidence is lacking (Schmitt, 1976).

The remaining representatives of this order are casual or rare migrants.

Anseriformes (ducks, geese, and swans)

Twenty-four representatives of this order have been recorded in the inventory area. Species composition includes one swan species, three species of geese, 18 species of ducks, and three species of mergansers.

Six species have been reported breeding in the area, primarily in the riparian habitats of the San Juan River. Three other species are summer residents and may therefore breed in the area, but definite evidence is lacking. Nesting sites are typically located in marshes and other aquatic vegetation along rivers and other water courses. The most important of the breeding species are considered to be the Canada goose (*Branta canadensis*), the mallard (*Anas platyrhynchos*), and the cinnamon teal (*Anas cyanoptera*). Most, if not all, of the annual production of Canada geese is the result of the establishment of a small resident flock on a privately owned refuge located near Farmington, New Mexico (Schmitt, 1976). It is doubtful that, without this area, there would be any significant goose nesting occurring within the basin. All other species are migrants and occur as rare to common, depending on water conditions, time of year, and climatic conditions.

Galliformes (grouse, pheasants, quail, turkeys)

Members of this order which occur within the inventory area include three native species and two introduced species. Also included are two species which no longer inhabit the area.

The scaled quail (*Callipepla squamata*) is the most widely distributed and most numerous quail in New Mexico. They range throughout most of the inventory area and are found in semi-arid conditions, from the grassland/desert shrub community up to the lower elevation pinon-juniper woodland.

Gambel's quail (*Lophortyx gambelii*) inhabit shrubby vegetation of the arid lower sonoran zone at about the 6,500 foot elevation. They have only recently immigrated into the San Juan Valley, and according to available data are not found anywhere else in the inventory area.

The turkey (*Meleagris gallopavo*) occurs only on Mt. Taylor and the McGaffey area southeast of Gallup. Typically, these birds spend spring, summer and fall in the ponderosa/spruce-fir community utilizing it for breeding, feeding, roosting, and rearing of young. As snows deepen, they will move down into pinon-juniper woodlands. Since they are relatively water dependent, they seldom range far from surface water or snow if available.

The ring-necked pheasant (Phasianus colchicus) was introduced to New Mexico during the late 1800's and is typically found in association with irrigated fields and meadows. The white-winged variety was introduced in 1961 and occupies the same type of habitat. The only established populations of pheasants in the inventory area occur in the San Juan, La Plata, and Animas River drainages. It is likely that the species will continue to maintain itself in these areas but doubtful that they will ever become plentiful.

The chukar partridge (Alectoris graeca), introduced from Asia into New Mexico during the 1930's, has failed to establish significant populations within the state. The only known populations occur in the San Juan, Animas, La Plata River drainages. Campbell (1976) states it is unlikely the chukar will ever become an important species in New Mexico.

The remaining species in this order are the blue grouse (Dendragapus obscurus) and the sage grouse (Centrocercus urophasianus). The blue grouse was transplanted in the Mt. Taylor area in the late 1960's (Zapatka, 1977). Hubbard (1970) indicated the presence of blue grouse on Mt. Taylor, but with no evidence of breeding. However, Zapatka (personal communication, 1977) believes the species no longer inhabits this area.

The sage grouse once ranged in the study area in the big sagebrush habitat of northern San Juan County with the last reported observation occurring in 1921. Attempted reestablishment by the New Mexico Department of Game and Fish in 1933-1936, and 1949 and 1958 was unsuccessful.

Falconiformes (hawks, eagles, falcons, and vultures)

The order is represented by 17 species within the inventory area. These include one vulture species, one kite species, three Accipiter hawks, six Buteos, including two eagles, one harrier hawk, one osprey, and four species of falcons.

Three raptor species have received considerable attention as federal or state endangered birds; (1) the Southern bald eagle (Haliaeetus leucocephalus); (2) the peregrine falcon (Falco peregrinus); and osprey (Pandion haliaetus). The osprey is a rare and casual migrant through the area being reported in the San Juan Valley, Navajo Reservoir, and Morgan Lake.

The bald eagle maintains perhaps the largest wintering population in the state of New Mexico Department of Game and Fish refuge on Miller Mesa near Navajo Reservoir. Bald eagles are also

frequently observed along the Animas and San Juan Rivers. On the remainder of the area, the eagle is rare and observed only casually during periods of migration.

The peregrine falcon is a year-round resident, breeding in the area on cliffs, usually near water. Peregrine falcons are rare and casual throughout most of the proposed inventory area, being more widespread and numerous during migration (Hubbard, 1970).

The following raptors are year-round residents and nest in the inventory area: Sharp-shinned hawk (Accipiter striatus), Cooper's hawk (Accipiter cooperii), red-tailed hawk (Buteo jamaicensis), ferruginous hawk (Buteo regalis), golden eagle (Aquila chrysaetos), marsh hawk (Circus cyaneus), prairie falcon (Falco mexicanus), and American kestrel (Falco sparverius). The population densities of these birds vary seasonally indicating that migration does occur.

The northern breeding raptors that winter in or migrate through the area include the goshawk (Accipiter gentilis), rough-legged hawk (Buteo lagopus), and merlin (Falco columbarius). The Mississippi kite (Ictinia misisippiensis) was observed as an accidental in the San Juan Valley in June, 1973 (Schmitt, 1976).

Population numbers of raptors are hard to quantify. Hubbard (1970) believes that there appears to be a decline in numbers of birds of prey during recent years.

Gruiformes (cranes, rails, coots, and allies)

Four species represent this order in the inventory area. They are marsh-inhabiting species, breeding only in the San Juan Valley, except for the American coot (Fulica americana), which is commonly widespread and breeds in other aquatic areas of northwestern New Mexico.

The other three representatives, Virginia rail (Rallus limicola), sora (Porzana carolina), and common gallinule (Gallinula chloropus), are all summer residents and tend to be secretive, but perhaps are more common than reports indicate (Schmitt, 1976). Dense, undisturbed aquatic vegetation is generally required for successful breeding.

Charadriiformes (gulls, phalaropes, sandpipers, and allies)

This large, diverse order contains several distinct groups of birds which include shorebirds, gulls, and terns. Within the inventory area, the order is represented by five species of

plovers, 15 species of sandpipers, one avocet, one stilt, two phalaropes, seven species of gulls, and four terns.

Of these 35 shorebird species, 28 are generally rare and occur only casually (ranging from accidental to irregular) as migrants through the area.

Definite breeding evidence is documented for the killdeer (Charadrius vociferus), mountain plover (Eupoda montana) and spotted sandpiper (Actitis macularia). The killdeer is the most common, widespread shorebird species of the San Juan Valley, also occurring south to Ft. Wingate and near Mt. Taylor (Bailey, 1928).

The spotted sandpiper breeds mainly in the mountainous areas of San Juan County. It does not nest in the inventory area, but does occur as a migrant and/or winter resident.

The mountain plover, on the other hand, is not a mountainous bird, but rather a short-grassland dweller, breeding in short-grass terrain, open plains, mesas, and ridges with a gravelly surface. Water is not a necessary requirement for breeding success. The first breeding record in the area was recently reported south of Fruitland, New Mexico by Nelson (New Mexico Ornithological Society, 1975).

Four other shorebirds have been reported in the area as being either summer or winter residents. These are the common snipe (Capella gallinago), American avocet (Recurvirostra americana), ring-billed gull (Larus delawarensis), and the black tern (Chlidonias niger).

Columbiformes (doves and pigeons)

Within the inventory area, representatives of this order include: the band-tailed pigeon (Columba fasciata), mourning dove (Zenaidura macroura), rock dove or domestic pigeon (Columba livia) and the rare and accidental Inca dove (Scardafella inca). The mourning dove is well distributed throughout New Mexico with an estimated population in peak years of fifteen million (New Mexico Department of Game and Fish, 1967). The majority of the population migrates into Texas and Mexico during the winter, with a few remaining in the state as year-round residents. Within the inventory area, the species is widespread and common and is found in all habitats.

The band-tailed pigeon breeds in all mountain ranges of New Mexico usually above 4,500 feet and is found in the inventory area of Mt. Taylor. Zapatka (1975) reported the distributional range to

include the northern border of New Mexico from La Plata River to Navajo Lake, and two-thirds of McKinley County from Grants westward to Gallup and south.

The rock dove or domestic pigeon is found almost exclusively in association with human habitation. It is generally considered an undesirable inhabitant of farm and city dwellings and other similar structures and is not considered an important bird species within the area.

Cuculiformes (cuckoos and allies)

The yellow-billed cuckoo (*Coccyzus americanus*) and the roadrunner (*Geococcyx californianus*) are the only two representatives of this order inhabiting the inventory area. The roadrunner is occasionally sighted in northwestern New Mexico where it is at the northern edge of its range. The yellow-billed cuckoo is a summer resident of the San Juan Valley. The cuckoo is known to breed in dense riparian shrubland (Schmitt, 1976), and is considered a rare to uncommon bird in the San Juan Basin.

Strigiformes (owls)

This order includes ten species of owls occurring in the area of which seven are known to breed. The seven species are the screech owl (*Otus asio*), flammulated owl (*Otus flammeolus*), great horned owl (*Bubo virginianus*), burrowing owl (*Speotyto cunicularia*), spotted owl (*Strix occidentalis*), long-eared owl (*Asio otus*), and and the saw-whet owl (*Aegolius acadicus*).

The great horned owl is a year-round resident and is widespread throughout the inventory area, inhabiting lowland, riparian areas and higher elevation woodlands and pine forests.

The screech owl is also a resident but it is generally rare and casual in northwestern New Mexico. The remaining species that nest in the area are summer residents only and migrate out of the area during winter months.

Non-breeding species include the barn owl (*Tyto alba*), a riparian, grassland and shrubland inhabiter reported to occur in the summer and winter months with no recorded evidence of breeding. The species is typically a southern lowland bird; the inventory area is the northern extension of its range. The pygmy owl (*Glaucidium gnoma*) is considered a migrant through the area, preferring pinon-juniper woodland and pine forest. The short-eared owl (*Asio flammeus*) is a winter resident in San Juan County and has been

recorded as a migrant elsewhere on the area. Being predatory birds, owls, as with other raptors, provide an important check on rodent populations.

Caprimulgiformes (night hawks and poor-wills)

The two species representing this order are summer residents in the area and breed from lowland shrub communities to open pine forests, and are widespread during migration.

The poor-will (Phalaenoptilus nuttallii) is a ground nester which has been reported breeding in the San Juan Valley (Schmitt, 1976). During periods of migration, the poor-will is reported in the southern part of the inventory area.

The common nighthawk (Chordeiles minor) is widespread throughout the area, especially during the summer months. During migration, these birds are often locally abundant in certain areas.

Apodiformes (hummingbirds and swifts)

Two species of swifts and four species of hummingbirds represent this order in northwestern New Mexico.

The white-throated swift (Aeronautes saxatalis) is the principal breeding swift. It is reported throughout the area as a summer resident with definite breeding evidence reported in the San Juan Valley (Schmitt, 1976). The species breeds in the cliffs of pinon-juniper woodlands and pine forests and forages for insects in nearby habitats.

The black swift (Cypseloides niger) is only a casual summer resident of the Navajo Lake area.

The black-chinned hummingbird (Archilochus alexandri) and broad-tailed hummingbird (Selasphorus platycercus) are widespread summer residents in riparian wooded areas throughout northwestern New Mexico. The black-chinned hummingbird has been reported breeding in San Juan Valley (Schmitt, 1976).

The rufous hummingbird (Selasphorus rufus) is a common migrant in all habitats, especially the wooded and forested areas. The calliope hummingbird (Stellula calliope), is a rare, casual migrant reported for the first time in Farmington in 1972 (New Mexico Ornithological Society, 1972).

Coraciiformes (kingfishers)

The single representative of this order within the inventory area is the belted kingfisher (Megaceryle alcyon). Kingfishers are exclusively riparian birds, reported only in the San Juan Valley, and were recorded nesting in the area in 1972 (Schmitt, 1976). It has not been reported as a migrant elsewhere on the area.

Piciformes (woodpeckers and sapsuckers)

Representatives of this order are primarily riparian, woodland and forest birds. A total of nine species have been recorded in the inventory area. The most abundant and widespread species is the common flicker (Colaptes auratus), a year-round resident throughout northwestern New Mexico. Breeding records for this species are widespread throughout the area. It is one of the more commonly observed members of the areas's avifauna.

The red-headed woodpecker (Melanerpes erythrocephalus) occurs as an occasional breeding bird in the riparian habitats of the San Juan River but migrates out of the area in winter.

The acorn woodpecker (Melanerpes formicivorus), Lewis' woodpecker (Asyndesmus lewis), yellow-billed sapsucker (Sphyrapicus varius), Williamson's sapsucker (Sphyrapicus thyroideus), and northern three-toed woodpecker (Picoides tridactylus) are all pine forest breeders in the mountains of the inventory area. Definite breeding evidence has been recorded in the area for Lewis' woodpecker, yellow-bellied sapsucker, and northern three-toed woodpecker. These five species are sighted frequently in the winter months and during migration when there is a movement into lower elevation habitat types.

The hairy woodpecker (Dendrocopos villosus) and the closely related downy woodpecker (Dendrocopos pubescens) are year-long residents ranging from riparian habitats to pine forests within the area. The hairy woodpecker has been recorded nesting in the San Juan Valley.

Passeriformes (sparrows, jays, wrens, and allies)

Passeriformes, often called perching birds, are the largest, most diverse group of avifauna occurring on the area. It is difficult to discuss such a diverse group as a whole; they are therefore discussed at the family level.

The flycatcher group (Family Tyrannidae) is well named for its foraging behavior, catching insects on the wing. The 15 species in the inventory area are widespread and occur in all habitats.

Only one species, Say's phoebe (Sayornis saya), can be a year-long resident. The other members of this family are summer residents, migrating out of the area in the fall.

The horned lark (Eremophila alpestris), the only member of the family Alaudidae, is the most abundant, regularly occurring bird throughout the entire area. Primarily a year-round resident, it inhabits the grassland/desert shrub community. The species has the capability to survive adverse conditions throughout the year during severe weather and short food supplies. No other species of bird is known to remain in some of the barren, overgrazed areas that the horned lark is known to exist (Ligon, 1961).

Members of the swallow family (Family Hirundinidae) are summer residents in the area. They are almost exclusively insectivorous and occupy habitats from grasslands to pine forests, and are often more commonly found near water where insects are more abundant.

Representatives of the jay and crow family (Family Corvidae) are, for the most part, year-round residents of the inventory area. Generally, these birds are woodland inhabitants. Although not considered migratory, they range considerable distances over the area during winter months in search of food. Of nine species recorded for the area, the blue jay (Cyanocitta cristata) and gray or Canada jay (Perisoreus canadensis) are the least likely to be encountered. They are considered rare visitors and are only seen casually. Of the five species recorded as breeding in the area, the black-billed magpie (Pica pica) restricts its nesting to the San Juan Valley, and Clark's nutcracker nests only on Mt. Taylor. The other three breeding species, the scrub jay (Aphelocoma coerulescens), common raven (Corvus corax) and pinon jay (Gymnorhinus cyanocephalus), have been recorded as nesting throughout the area.

Treated as a group, the families Paridae, Sittidae, and Certhiidae are small woodland and forest birds which include: chickadees, bushtits, titmice, nuthatches, and creepers. All individuals tend to be year-round residents in at least some part of the inventory area. Some extend into riparian areas at lower elevations during the winter months but are most commonly found in pinon-juniper woodlands and pine forest communities. The black-capped chickadee and mountain chickadee (Parus atricapillus and Parus gambeli), common bushtit (Psaltriparus minimus), and pygmy nuthatch (Sitta pygmaea) travel in flocks, and are perhaps observed more frequently due to this behavior. Other representatives of this group are more secretive and perhaps are overlooked.

The family Cinclidae contains only one species occurring in the western United States; the dipper (Cinclus mexicanus). It is a

unique bird in both habitat preference and behavior. This bird prefers rushing streams in pine forests but will range into pinon-juniper woodlands. Its behavior is a characteristic bobbing motion, and it will dive and submerge in the water feeding on aquatic insects. No breeding evidence is recorded for the inventory area.

The wren family (Family Troglodytidae) includes five representatives which all breed in the inventory area. Abundance and frequency of occurrence varies considerably with season and location. The most commonly observed species are the rock wren (Salpinctes obsoletus) and the canon wren (Catherpes mexicanus) which are found in cliffs, canyons, and rocky slopes. The long-billed marsh wren (Telmatodytes palustris) is strictly a marsh, riparian bird. Like the majority of wrens, this species is heard more often than seen. Bewick's wren (Thryomanes bewickii) and the house wren (Troglodytes aedon) are found in similar thicket-type habitats in riparian areas, woodlands, and forests.

The mockingbird, catbird, and thrashers (Family Mimidae) are primarily grassland and shrubland type birds. The mockingbird (Mimus polyglottos) and sage thrasher (oreoscoptes montanus) are year-round residents breeding in sagebrush grassland and shrubland. Bendire's thrasher (Toxostoma bendirei) is a summer resident, and is known to breed from shrubland to pinon-juniper woodland areas. The catbird (Dumetella carolinensis) and brown thrasher (Toxostoma rufum) are rare migrants in the area.

The family Turdidae includes the robin (Turdus migratorius), western bluebird (Sialia mexicana), mountain bluebird (Sialia currucoides) and Townsend's solitaire (Myadestes townsendi); all are important year-round residents in the area. These birds are usually not found in grassland and shrubland associations, but prefer lowland riparian areas and pine forests. Generally, these species breed at higher elevations, moving into lowlands in the winter. The hermit thrush and Swainson's thrush (Hylocichla guttata) and (Hylocichla ustulata) are both high elevation pine forest nesters and are only casually seen. The eastern bluebird (Sialia sialis) is a migrant in the area.

The family Sylviidae comprises a group of small birds including the gnatcatchers and kinglets. The blue-gray gnatcatcher (Polioptila caerulea) is reported breeding throughout the proposed inventory area in shrubland and woodland habitats; the species leaves the state during winter. The Ruby-crowned kinglet and Golden-crowned kinglet (Regulus calendula) and (Regulus satrapa) respectively, winter in the area. They move into the pine forests from surrounding mountainous areas. Both species utilize fir and spruce forests as nesting habitat.

The single representative of the family Motacillidae is the water pipit (Anthus spinoletta). It occurs as both a winter resident and migrant in parts of the area. The species is considered rare and casual over most of the area.

The family Bombycillidae is represented in the area by the Bohemian Waxwing (Bombycilla garrula) and the Cedar Waxwing (Bombycilla cedrorum). Both species are winter residents and migrants in the area with the Bohemian Waxwing being a more rare and casual visitor whereas the Cedar Waxwing has been observed year-round in the San Juan Valley. They often winter in residential areas using trees for roosting sights.

The shrikes (Family Laniidae) are hawklike songbirds with food preferences which include lizards, small birds and insects. In productive areas, the loggerhead shrike (Lanius ludovicianus) is a common and regular year-round resident. The northern shrike (Lanius excubitor) is only a casual visitor to northern New Mexico in the winter months. They favor open country such as the grassland/desert shrub community for perching and feeding.

The family Sturnidae has one representative in the area, the starling (Sturnus vulgaris). It was introduced from Europe and is highly competitive and adaptive. The species was first introduced in 1890 and 1891, when 100 birds were released in New York City, and now millions of these birds occur across most of the United States (Ligon, 1961). They were first recorded in New Mexico in 1935 and had reached the San Juan River by 1946 (Hubbard, 1970). Many believe the species is taking over breeding habitats of native riparian birds. The increased number of starlings, unless effectively controlled, may present serious problems in residential and agricultural areas.

The vireos are small gray birds of the family Vireonidae. Four species have been recorded in the area. Three are summer residents, breeding in pinon/pine woodlands and upward into pine forests, including adjacent riparian habitats. While not abundant, the warbling vireo (Vireo gilvus) and solitary vireo (Vireo solitarius) are the most widespread in the preferred habitats. The gray vireo (Vireo vicinior) has been recorded in the area as a casual and irregular visitor and Red-eyed vireo (Vireo olivaceus) is considered rare and accidental to the area.

Of the 22 species of the warblers (Family Parulidae) recorded in the general area, only six are known to breed in the inventory area. Two others are summer residents as well as migrants, but no breeding evidence has been reported for them.

The common yellowthroat (Geothlypis trichas), yellow-breasted chat (Icteria virens), and yellow warbler (Dendroica petechia) are primarily riparian breeders. The yellow-rumped warbler (Dendroica nigrescens), and Grace's warbler (Dendroica graciae) are woodland and forest breeders.

The remaining warblers are generally rare to uncommon and occur casually in various habitats of the area.

The house sparrow (Passer domesticus), a member of the Ploceidae family, is another introduced species from Europe. The bird, first released in New York in 1851 and 1852, is widespread from Canada to Argentina (Ligon, 1961). This species is primarily found near cities, villages, and rural settlements. Unlike the starling, this bird is not as yet in serious conflict with endemic bird species.

Members of the family Icteridae, blackbirds, etc. occur primarily in riparian habitats, and are an important breeding group in the inventory area. Nine of the 10 species recorded in the area are known nesters in the San Juan Valley. The most important birds of this group in terms of numbers and habitat use are the red-winged blackbird (Agelaius phoeniceus), yellow-headed blackbird (Xanthocephalus xanthocephalus), and brown-headed cowbird (Molothrus ater). The red-winged blackbird is the only year-round resident. The yellow-headed blackbird, boat-tailed grackle (Cassidix mexicanus), and brown-headed cowbird are sometimes winter residents in the area. Scott's oriole (Icterus parisorum), Brewer's blackbird (Euphagus cyanocephalus), and western meadowlark (Sturnella neglecta) are grassland and shrubland breeders and are more important inhabitants in these areas than in riparian habitat.

The only breeding member of the family Thraupidae, the western tanager (Piranga ludoviciana), has been reported breeding in the area which is considered the southern extension of its range. The species breeds from riparian habitats up into pine forests. Western tanagers are widespread during migration, as are the other two non-breeding species of tanagers reported in the area, the Scarlet tanager (Piranga olivacea) and the Hepatic tanager (Piranga flava).

The family Fringillidae is the largest and most diverse group of passeriformes. The family includes specialized seed-eating birds such as the grosbeaks, finches, towhees and sparrows. Most members are migrants through the area during summer and winter months; few are year-round residents.

Breeding grosbeaks include the black-headed grosbeak (Pheuticus melanocephalus), blue grosbeak (Guiraca caerulea), indigo bunting (Passerina cyanea), and Lazuli bunting (Passerina amoena). The black-headed grosbeak breeds in higher elevation habitats of the pinon/juniper and ponderosa pine forests and the latter three are lower riparian breeders of grassland and shrubland habitats. Other grosbeak species tend to be rare, casual migrants through the area.

The finch group includes the house finch (Carpodacus mexicanus), a year-round breeding resident; the pine siskin (Spinus pinus), American goldfinch (Spinus tristis), and lesser goldfinch (Spinus psaltria). Each of these species occupies a wide range of habitats, generally breeding in higher elevations and moving into lower elevations during winter months.

The rufous-sided towhee (Pipilo erythrophthalmus) and brown towhee (Pipilo fuscus) nest in the area. Both species are abundant and are frequently observed. The green-tailed towhee has been recorded to occur in the area during summer and also as a migrant in grasslands, shrublands, and adjacent riparian habitats, but no evidence suggests breeding.

Of 18 sparrow species recorded for the area, half are considered important inhabitants of the area with seven reported as nesting and two wintering species. The sage sparrow (Amphispiza belli) and gray-headed junco (Junco caniceps) are the only breeding birds that remain in the area during winter. The other summer residents migrate out of the area and are replaced by winter residents. The breeding species include the vesper sparrow (Pooecetes gramineus), lark sparrow (Chondestes grammacus), black-throated sparrow (Amphispiza bilineata), sage sparrow, gray-headed junco, chipping sparrow (Spizella passerina), and Brewer's sparrow (Spizella breweri). Winter residents include the Dark-eyed junco (Junco oreganus), and the white-crowned sparrow (Zonotrichia leucophrys). The juncos are found in the higher elevations, and the white-crowned sparrow at lower elevations.

The remaining sparrows and other fringillids not mentioned are migrants and winter residents.

Table 2. Avifauna observed or known to occur in the inventory area

ORDER - COMMON NAME	SCIENTIFIC NAME	HABITAT 1/	SEASON 2/	ABUNDANCE 3/	FREQUENCY 4/	ADDIT'L REMARKS
Order Gaviformes						
Common loon	Gavia immer	R	WR,M	R	C-O	

1/ Habitat Preference
- R - Riparian
- G/S - Grassland/Desert Shrub
- PJ - Pinon-Juniper Woodland
- PP - Ponderosa Forest

2/ Season of Occurrence
- YR - Yearlong Resident
- SR - Summer Resident
- WR - Winter Resident
- M - Migrant

3/ Abundance as taken from Hubbard (1970)
- R - Rare
- U - Uncommon
- F - Fairly Common
- C - Common
- A - Abundant

4/ Frequency of Occurrence as taken from Hubbard (1970)
- X - Accidental (recorded but unexpected)
- C - Casual
- O - Occasional
- I - Irregular
- R - Regular

* Observed on transects

\# See Section 9, Endangered and Threatened Species

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1/]	SEA-SON[2/]	ABUN-DANCE[3/]	FRE-QUENCY[4/]	ADDIT'L REMARKS
Order Podicipediformes						
Horned grebe	Podiceps auritus	R	WR,M	R-U	C-O	
*Eared grebe	Podiceps caspicus	R	YR,SR	R-C	C-O	Breeds
Western grebe	Aechmophorus occidentalis	R	WR	R-F	O	
Pied-billed grebe	Podilymbus podiceps	R	SR,WR,M	R-F	C-O	Breeds
Order Pelicaniformes						
White pelican	Pelecanus erythrorhynchos	R	M	R-U	C	
Double-crested cormorant	Phalacrocorax auritus	R	M	R-U	C	
Order Ciconiiformes						
*Great blue heron	Ardea herodias	R	YR,SR	U-F	C-O	Breeds
Green heron	Butorides striatus	R	YR,WR	R-U	C-O	May breed
Great egret	Casmerodius albus	R	M	R-F	C	
Snowy egret	Leucophoyx thula	R	M	R-F	C	
Black-crowned night heron	Nycticorax nycticorax	R	SR,M	R-U	C-I	May breed
Least bittern	Ixobrychus exilis	R	SR	R-U	C	May breed
*American bittern	Botaurus lentiginosus	R	SR,WR,M	R-U	C-O	Breeds
White-faced ibis	Plegadis chihi	R	SR,M	R-F	C	
Order Anseriformes						
Whistling swan	Olor columbianus	R	WR,M	R-U	C	
Canada goose	Branta canadensis	R	YR,M	R-F	C-I	Breeds
White-fronted goose	Anser albifrons	R	WR,M	R-U	C-O	
Snow goose	Chen hyperborea	R	WR	R	C-O	
*Mallard	Anas platyrhynchos	R	YR	R-A	I-R	Breeds
*Gadwall	Anas strepera	R	YR,SR,WR,M	U-F	C-O	
*Pintail	Anas acuta	R	YR,SR,M	R-F	C-O	Breeds
*Green-winged teal	Anas carolinensis	R	WR,M	R-A	C	

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1]	SEA-SON[2]	ABUN-DANCE[3]	FRE-QUENCY[4]	ADDIT'L REMARKS
Order Anseriformes cont'd						
*Blue-winged teal	Anas discors	R	YR,SR,M	R-C	O	May breed
*Cinnamon teal	Anas cyanoptera	R	SR,WR	U-C	C-I	Breeds
*American wigeon	Mareca americana	R	WR,M	R-U	C-O	
*Northern shoveler	Spatula clypeata	R	YR,WR,M	R-C	R	May breed
Wood duck	Aix sponsa	R	WR,M	R-U	C	
*Redhead	Aythya americana	R	SR,WR,M	R-F	C-O	May breed
*Ring-necked duck	Aythya collaris	R	WR,M	R-F	C	
*Canvasback	Aythya valisineria	R	WR,M	R-F	O	
*Lesser scaup	Aythya affinis	R	WR,M	R-U	C-O	
*Common goldeneye	Bucephala clangula	R	SR,WR,M	R-F	C	
Barrow's goldeneye	Bucephala islandica	R	WR	R	X	
*Bufflehead	Bucephala albeola	R	WR,M	R-F	C	
Surf scoter	Melanitta perspicillata	R	M	R	X	
*Ruddy duck	Oxyura jamaicensis	R	SR,WR,M	R-C	O	Breeds
Hooded Merganser	Lophodytes cucullatus	R	WR	R	C-I	
*Common Merganser	Mergus merganser	R	YR	R-U	O	Breeds
Red-breasted merganser	Mergus serrator	R	M	R-U	C-O	
Order Falconiformes						
*Turkey vulture	Cathartes aura	G/S, PJ,PP	SR	U-C	C-I	Breeds
#Mississippi kite	Ictinia mississippiensis	R	M	R	X	Endangered
*Goshawk	Accipiter gentilis	PJ/PP	SR,WR,M	R-U	I	
*Sharp-shinned hawk	Accipiter striatus	G/S,R PJ,PP	YR	R-F	I	Breeds
*Cooper's hawk	Accipiter cooperii	PJ,PP, R	YR,SR	R-U	O	Breeds
*Red-tailed hawk	Buteo jamaicensis	G/S PJ,PP	YR	R-U	O-I	Breeds

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1/]	SEA-SON[2/]	ABUN-DANCE[3/]	FRE-QUENCY[4/]	ADDIT'L REMARKS
Order Falconiformes cont'd						
Swainson's hawk	Buteo swainsoni	G/S,R	SR	U-F	C-O	Breeds
*Rough-legged hawk	Buteo lagopus	G/S	WR,M	R-C	I	
Ferruginous hawk	Buteo regalis	G/S,PJ	WR,M	R-F	C-O	May breed
*Golden eagle	Aquila chrysaetos	G/S,PJ	YR	R-U	I	Breeds
#*Bald eagle	Haliaeetus leucocephalus	R	WR,M	R	C	Endangered
*Marsh hawk	Circus cyaneus	G/S,R	SR,WR,M	R-F	O	Breeds
#*Osprey	Pandion haliaetus	R	M	R	O	Endangered
*Prairie falcon	Falco mexicanus	PJ	YR	R-U	C-O	Breeds
#Peregrine falcon	Falco peregrinus	G/S,R, PJ	YR	R	C-O	Breeds Endangered
Merlin	Falco columbarius	PJ	WR,M	R	C	
*American kestrel	Falco sparverius	G/S,R, PJ,PP	YR	F	O-R	Breeds
Order Galliformes						
Blue grouse	Dendragapus obscurus	PP				Transplanted into area but not established
Sage grouse	Centrocercus urophasianus	G/S				Historically in area but not there now
*Scaled quail	Callipepla squamata	G/S,R	YR	U-C	O-R	Breeds
*Gambel's quail	Lophortyx gambelii	G/S,R, PJ	YR	R-C	I-R	Breeds
*Ring-necked pheasant	Phasianus colchicus	G/S,R	YR	R-F	O-R	Breeds-Introduced
Chukar	Alectoris graeca	G/S	YR	R-U	C	Breeds-Introduced

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1/]	SEA-SON[2/]	ABUN-DANCE[3/]	FRE-QUENCY[4/]	ADDIT'L REMARKS
Order Galliformes cont'd						
*Turkey	Meleagris gallopavo	PJ,R, PP	YR	R-C	O-R	Breeds
Order Gruiformes						
Virginia rail	Rallus limicola	R	SR	R-U	C-I	Breeds
*Sora	Porzana carolina	R	SR	R-F	C-I	Breeds
Common gallinule	Gallinula chloropus	R	SR,M	R-C	O-I	Breeds
*American coot	Fulica americana	R	YR	F-C	C-R	Breeds
Order Charadriiformes						
Semi-palmated plover	Charadrius semi-palmatus	R	M	R	I	
Snowy plover	Charadrius alex-andrinus	R	M	R-F	C	
*Killdeer	Charadrius vociferus	R	YR,SR	R-C	I-R	Breeds
Mountain plover	Eupoda montana	G/S,R	SR,M	R-F	C-O	Breeds
Black-bellied plover	Squatarola squatarola	G/S,R	M	R-U	C	
*Common snipe	Capella gallinago	R	WR,M	R-F	C-O	
Long-billed curlew	Numenius americanus	R	M	R-F	C	
Upland plover	Bartramia longicauda	G/S,R	M	R-F	C	
*Spotted sandpiper	Actitus macularia	PP,R	SR,UR,M	R-F	C-I	Breeds
Solitary sandpiper	Tringa solitaria	R	M	R-F	C	
Willet	Catoptrophorus semi-palmatus	R	M	R-F	C	
*Greater yellowlegs	Totanus melanoleucus	R	M	R	C	
Lesser yellowlegs	Totanus flavipes	R	M	R	C-O	
Pectoral sandpiper	Erolia melanotos	G/S,R	M	R-U	C-O	
Baird's sandpiper	Erolia bairdii	R	M	R-F	O-R	
Least sandpiper	Erolia minutilla	R	M	R-U	C-O	
Long-billed dowitcher	Limnodromus scolopaceus	R	M	R-F	C	
Western sandpiper	Ereunetes mauri	R	M	R-U	C	

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HABITAT[1]	SEASON[2]	ABUNDANCE[3]	FREQUENCY[4]	ADDIT'L REMARKS
Order Charadriiformes cont'd						
Marbled godwit	Limosa fedoa	R	M	R-U	C-O	
Sanderling	Crocethia alba	R	M	R-U	C	
American avocet	Recurvirostra americana	R	M,SR	R-F	C-O	
Black-necked stilt	Himantopus mexicanus	R	M	R-F	O	
Wilson's phalarope	Steganopus tricolor	R	M	R-C	O	
Northern phalarope	Lopipes lobatus	R	M	R-F	C-I	
Herring gull	Larus argentatus	R	M	R-U	C	
California gull	Larus californicus	R	M	R	X	
*Ring-billed gull	Larus delawarensis	R	M,WR	R-U	C-O	
Laughing gull	Larus atricilla	R	M	R	X	
Franklin's gull	Larus pipixcan	R	M	R-U	C-I	
Bonaparte's gull	Larus philadelphia	R	M	R-U	C-I	
Sabine's gull	Xema sabini	R	M	R	X	
Forster's tern	Sterna forsteri	R	M	R-F	C-O	
Common tern	Sterna hirundo	R	M	R	X	
Caspian tern	Sterna caspia	R	M	R	X	
Black tern	Chlidonias niger	R	M,SR	R-C	C-O	
Order Columbiformes						
*Band-tailed pigeon	Columba fasciata	PJ,PP, R	SR	R-C	I	Breeds
*Rock dove	Columba livia	G/S,R	YR	R-U	O-R	Breeds
*Mourning dove	Zenaidura macroura	G/S,R PJ	YR,SR	F-A	I-R	Breeds
Inca dove	Scardafella inca	R	WR,M	R	X	
Order Cuculiformes						
Yellow-billed cuckoo	Coccyzus americanus	R	SR	R-U	I	Breeds
*Roadrunner	Geococcyx californianus	G/S, PJ,R	YR	R	C	

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1/]	SEA-SON[2/]	ABUN-DANCE[3/]	FRE-QUENCY[4/]	ADDIT'L REMARKS
Order Strigiformes						
Barn owl	Tyto alba	G/S,R	SR,WR	R	C	
Screech owl	Otus asio	PJ,R, PP	YR,SR,WR	R	C	Breeds
Flammulated owl	Otus flammeolus	PP	SR	R-U	C	Breeds
*Great-horned owl	Bubo virginianus	R	YR,SR	R-F	C-I	
Pygmy owl	Glaucidium gnoma	PG,PP	M	R	C	
*Burrowing owl	Athene cunicularia	G/S	SR	R-F	C-I	Breeds
Spotted owl	Strix occidentalis	PJ,PP	SR,M	R-F	C-I	Breeds
Long-eared owl	Asio otus	PJ,R	SR	R-U	C	Breeds
Short-eared owl	Asio flammeus	G/S	WR,M	R-F	C	
Saw-whet owl	Aegolius acadicus	PP	SR	R	C	Breeds
Order Caprimulgiformes						
Poor-will	Phalaenoptilus nuttallii	G/S PJ,PP	SR,M	R-F	C-O	Breeds
Common nighthawk	Chordeiles minor	G/S,R, PJ,PP	SR	F-C	I-R	Breeds
Order Apodiformes						
Black swift	Cypseloides niger	R	SR,M	R	C-O	
White-throated swift	Aeronautes saxatalis	PJ,PP	SR,M	R-F	C-I	Breeds
*Black-chinned hummingbird	Archilochus alexandri	G/S,R, PJ	SR	R-F	C-O	Breeds
*Broad-tailed hummingbird	Selasphorus platycercus	PJ,PP, R	SR,M	U-C	O	May breed
Rufous hummingbird	Selasphorus rufus	G/S,R, PJ,PP	M	R-C	C-O	
Calliope hummingbird	Stellula calliope	PP	M	R	X	
Order Coraciiformes						
*Belted kingfisher	Megaceryle alcyon	R	SR,WR	U-F	O-R	Breeds
Order Piciformes						
*Common flicker	Colaptes auratus	PP,R	YR	F-C	I-R	Breeds

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1]	SEA-SON[2]	ABUN-DANCE[3]	FRE-QUENCY[4]	ADDIT'l REMARKS
Order Piciformes cont'd						
#Red-headed woodpecker	Melanerpes erythro-cephalus	R	SR	R-U	O	Endangered Breeds
*Acorn woodpecker	Melanerpes formici-vorus	PP	YR,SR, WR,M	R-C	C-O	
Lewis' woodpecker	Melanerpes lewis	PJ,PP, R	YR,SR	R-C	O-I	Breeds
*Yellow-bellied sap-sucker	Sphyrapicus varius	PJ,PP, R	SR,M	R-F	O-I	Breeds
*Williamson's sapsucker	Sphyrapicus thyroideus	PJ,PP	YR,SR,WR	R-F	O-I	
*Hairy woodpecker	Picoides villosus	PJ,PP, R	YR	R-C	C-O	Breeds
Downy woodpecker	Picoides pubescens	PJ,PP, R	YR,SR	R-F	C-O	May breed
Northern three-toed woodpecker	Picoides tridactylus	PP	SR	R-U	C-O	Breeds
Order Passeriformes						
*Eastern kingbird	Tyrannus tyrannus	R	SR	U-F	O-I	Breeds
*Western kingbird	Tyrannus verticalis	G/S,PJ	SR	U-F	C-R	Breeds
*Cassin's kingbird	Tyrannus vociferans	PJ,PP, R	SR	U-C	O-R	Breeds
*Ash-throated flycatcher	Myiarchus cinerascens	G/S,PJ, PP	SR	F	O-R	Breeds
Eastern phoebe	Sayornis phoebe	R	M	R	C	
Black phoebe	Sayornis nigricans	R	SR	R	C	
*Say's phoebe	Sayornis saya	G/S	YR,SR	F	O	Breeds
Willow flycatcher	Empidonax traillii	PP,R	SR,M	R-F	C-O	
Hammond's flycatcher	Empidonax hammondii	PP	SR,M	R	C-O	
Dusky flycatcher	Empidonax oberholseri	PP	SR,M	R-U	C	
*Gray flycatcher	Empidonax wrightii	G/S,PJ	SR	R-F	C-O	Breeds
Western flycatcher	Empidonax difficilis	PJ,PP R	SR,M	U-F	C	

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1/]	SEA-SON[2/]	ABUN-DANCE[3/]	FRE-QUENCY[4/]	ADDIT'L REMARKS
Order Passeriformes cont'd						
Coues' flycatcher	Contopus pertinax	PJ,PP	SR	R	C	
*Western wood pewee	Contopus sordidulus	PJ,PP, R	SR,M	U-F	C-R	Breeds
*Olive-sided flycatcher	Nuttallornis borealis	PP,R	SR,M	R-F	O-I	
*Horned lark	Eremophila alpestris	G/S	YR	C-A	R	Breeds
*Violet-green swallow	Trachycineta thalassina	PP	SR	U-C	C-R	
Tree swallow	Iridoprocne bicolor	PJ,R, PP	SR,M	R-U	I	
Bank swallow	Riparia riparia	G/S,R	SR,M	R-F	C-O	
*Rough-winged swallow	Stelgidopteryx ruficollis	R	SR	C	I-R	Breeds
*Barn swallow	Hirundo rustica	G/S	SR	C-A	O-R	Breeds
*Cliff swallow	Petrochelidon pyrrhonata	G/S	SR	C-A	O-R	Breeds
Purple martin	Progne subis	PP	SR,M	R-U	C	Breeds
Gray jay	Perisoreus canadensis	PP	YR	R	C	
Blue jay	Cyanocitta cristata	PJ,R	M,WR	R-U	X	
*Steller's jay	Cyanocitta stelleri	PJ,PP	SR,WR	U-C	I	May breed
*Scrub jay	Aphelocoma coerulescens	G/S, PJ	YR	U-F	C-I	Breeds
*Black-billed magpie	Pica pica	G/S,R, PJ,PP	YR	R-C	I-R	
*Common raven	Corvus corax	PJ,PP	YR,SR	U-F	C-R	Breeds
*Common crow	Corvus brachyrhynchos	G/S,R, PJ,PP	YR,WR	R-F	C-I	
*Pinon jay	Gymnorhinus cyanocephalus	PJ	YR,WR	R-F	C-I	Breeds
*Clark's nutcracker	Nucifraga columbiana	PP	YR,WR,M	R-C	I-R	Breeds
*Black-capped chickadee	Parus atricapillus	PJ,R, PP	YR,WR	F	C-I	Breeds

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1]	SEA-SON[2]	ABUN-DANCE[3]	FRE-QUENCY[4]	ADDIT'L REMARKS
Order Passeriformes cont'd						
*Mountain chickadee	Parus gambeli	PJ,PP, R	YR,WR	U-C	I-R	Breeds
*Plain titmouse	Parus inornatus	PJ	YR,SR,WR	U-F	C-I	Breeds
*Common bushtit	Psaltriparus minimus	PJ,R, PP	YR,M	U	I	Breeds
*White-breasted nuthatch	Sitta carolinensis	PJ,R, PP	YR,SR	U	C-O	Breeds
*Red-breasted nuthatch	Sitta canadensis	PJ,R, PP	YR,WR,M	R-U	C-O	Breeds
*Pygmy nuthatch	Sitta pygmaea	PJ,R, PP	YR,WR	U-C	C-I	Breeds
Brown creeper	Certhia familiaris	PJ,PP	YR,SR,WR	R-F	O-I	Breeds
Dipper	Cinclus mexicanus	PJ,R, PP	YR,WR	R-F	O-I	
House wren	Troglodytes aedon	PJ,R, PP	SR	U-C	I-R	Breeds
*Bewick's wren	Thryomanes bewickii	PJ,R, PP	YR,SR	R-U	O-I	Breeds
*Long-billed marsh wren	Cistothorus palustris	R	SR,WR,M	R-F	I-R	Breeds
*Canon wren	Catherpes mexicanus	G/S, PJ,PP	YR,SR,M	U-C	O-R	Breeds
*Rock wren	Salpinctes obsoletus	G/S, PJ,PP	YR,SR	U-C	O-R	Breeds
*Mockingbird	Mimus polyglottus	G/S, PJ,PP	YR,SR,WR	U-C	C-R	Breeds
Gray catbird	Dumetella carolinensis	G/S,R	M	R-U	C-I	May breed
Brown thrasher	Toxostoma rufum	G/S	WR,M	R	C-I	
*Bendire's thrasher	Toxostoma bendirei	G/S,PJ	SR	R-U	C-I	Breeds
*Sage thrasher	Oreoscoptes montanus	G/S	YR,SR,WR	U-F	C-O	Breeds
*American robin	Turdus migratorius	PJ,R, PP	YR	C	O-R	Breeds

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1/]	SEA-SON[2/]	ABUN-DANCE[3/]	FRE-QUENCY[4/]	ADDIT'L REMARKS
Order Passeriformes cont'd						
*Hermit thrush	Hylocichla guttata	PP,R	YR,SR,WR	R-U	C-I	Breeds
Swainson's thrush	Hylocichla ustulata	PJ,PP, R	SR	R-U	C-O	
Eastern bluebird	Sialia sialis	PJ	WR,M	R-U	C-O	
*Western bluebird	Sialia mexicana	PJ,R, PP	YR,SR	U-C	I-R	Breeds
*Mountain bluebird	Sialia currocoides	PJ,PP	YR	R-C	I-R	Breeds
*Townsend's solitaire	Myadestes townsendi	PJ,PP	YR,SR,WR	R-F	I-R	Breeds
*Blue-gray gnatcatcher	Polioptila caerulea	G/S,PJ	SR,M	R-C	O-I	Breeds
Golden-crowned kinglet	Regulus satrapa	PP	WR,M	R-U	C-I	
Ruby-crowned kinglet	Regulus calendula	PJ,PP	WR,M	R-F	C-I	
*Water pipit	Anthus spinoletta	PJ,PP, R	WR,M	R-U	C-O	
Bohemian waxwing	Bombycilla garrula	PJ	WR,M	R-C	C-O	
Cedar waxwing	Bombycilla cedrorum	PJ	WR,M	U-C	O-I	
*Northern shrike	Lanius excubitor	G/S	WR,M	R	C-O	
*Loggerhead shrike	Lanius ludovicianus	G/S,PJ	YR,SR	U-C	I-R	Breeds
*Starling	Sturnus vulgaris	PJ,R	YR	F-C-A	O-R	Breeds, Introduced
*Gray vireo	Vireo vicinior	PJ	SR,M	U-F	C-I	Breeds
*Solitary vireo	Vireo solitarius	PJ,PP, R	SR	U-C	C-I	Breeds
Red-eyed vireo	Vireo olivaceus	PJ	M	R	X	
Warbling vireo	Vireo gilvus	PJ,PP, R	SR	R-C	C-O	Breeds
Black and white warbler	Mniotilta varia	PJ	M	R	C-O	
Orange-crowned warbler	Vermivora celata	PP	SR,M	R-U	C-O	
Nashville warbler	Vermivora ruficapilla	PJ	M	R	X	

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1]	SEA-SON[2]	ABUN-DANCE[3]	FRE-QUENCY[4]	ADDIT'L REMARKS
Order Passeriformes cont'd						
Virginia's warbler	Vermivora virginiae	R,PJ, PP	SR,M	U-F	O	Breeds
Lucy's warbler	Vermivora luciae	R,G/S	M	R	C	
*Yellow warbler	Dendroica petechia	R,PJ, PP	SR,M	R-C	O-I	Breeds
Magnolia warbler	Dendroica magnolia	PP	M	R	X	
Black-throated blue warbler	Dendroica caerulescens	PJ	M	R	X	
*Yellow-rumped warbler	Dendroica auduboni	PJ,PP	YR,SR	U-C	O-R	Breeds
*Black-throated gray warbler	Dendroica nigrescens	PJ	SR,M	U	O	Breeds
Townsend's warbler	Dendroica townsendi	R,PJ, PP	M	R-U	C-O	
Black-throated green warbler	Dendroica virens	PP	M	R	X	
Hermit warbler	Dendroica occidentalis	PJ,PP	M	R-U	C	
Grace's warbler	Dendroica graciae	PJ,PP	SR,M	R-F	C-I	Breeds
Palm warbler	Dendroica palmarum	PJ	M	R	X	
Ovenbird	Seiurus aurocapillus	PJ	M	R	X	
Northern waterthrush	Seiurus noveboracensis	R	M	R	C-O	
MacGillivray's warbler	Oporonis tolmiei	R,PP	M,SR	R-F	C-I	
*Common yellowthroat	Geothlypis trichas	R	SR,M	R-C	I	Breeds
*Yellow-breasted chat	Icteria virens	R,G/S	SR	U-C	O-R	Breeds
Wilson's warbler	Wilsonia pusilla	R,G/S	M	R-F	I-R	
American redstart	Setophaga ruticilla	PJ	M	R-U	C-I	
*House sparrow	Passer domesticus	G/S,PJ	YR	U-C	R	Breeds, Introduced
Eastern meadowlark	Sturnella magna	G/S,R	SR	R-U	C-I	
*Western meadowlark	Sturnella neglecta	G/S,R	SR	U-C	O-R	Breeds

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1/]	SEA-SON[2/]	ABUN-DANCE[3/]	FRE-QUENCY[4/]	ADDIT'L REMARKS
Order Passeriformes cont'd						
*Yellow-headed blackbird	Xanthocephalus xanthocephalus	R	SR,WR	F-C-A	C-R	Breeds
*Red-winged blackbird	Agelaius phoeniceus	R,PJ, PP	YR,SR	C-A	R	Breeds
*Scott's oriole	Icterus parisorum	G/S,PJ	SR	U-F	O-I	Breeds
*Northern oriole	Icterus galbula	R	SR	U-C	O-R	Breeds
*Brewer's blackbird	Euphagus cyanocephalus	G/S,R	SR	U-F	C-R	Breeds
*Great-tailed grackle	Quiscalus mexicanus	R	SR,WR	U-C	C-O	Breeds
Common grackle	Quiscalus quiscula	R	SR	R	C-O	Breeds
*Brown-headed cowbird	Molothrus ater	R,PJ, PP	SR,WR	F-C	O-R	Breeds
*Western tanager	Piranga ludoviciana	R,PJ, PP	SR,M	R-F	C-O	Breeds
Scarlet tanager	Piranga olivacea	R,PP	M	R	X	
Hepatic tanager	Piranga flava	PP	M	R-U	C-O	
Rose-breasted grosbeak	Pheuticus ludovicianus	PJ	M	R-U	C-I	
*Black-headed grosbeak	Pheuticus melanocephalus	R,PJ, PP	SR	U-F	O-R	Breeds
*Blue grosbeak	Guiraca caerulea	G/S,R	SR	U-F	O-R	Breeds
Indigo bunting	Passerina cyanea	R,G/S	SR	R-F	C-O	Breeds
Lazuli bunting	Passerina amoena	R,G/S	SR	R-F	O-I	Breeds
Dickcissel	Spiza americana	G/S	M	R	X	
*Evening grosbeak	Hesperiphona vespertina	PJ,PP	YR,WR,SR	R-F	C-R	
*Cassin's finch	Carpodacus cassinii	PJ,PP	YR,WR,M	R-U	C-I	
*House finch	Carpodacus mexicanus	G/S,R, PJ	YR,SR	U-C	I-R	Breeds
Gray-crowned rosy finch	Leucosticte tephrocotis	PJ,PP, R	M	R-C	O-I	
Black rosy finch	Leucostricte atrata	PJ,PP, R	M	R-U	C-O	

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1/]	SEA-SON[2/]	ABUN-DANCE[3/]	FRE-QUENCY[4/]	ADDIT'L REMARKS
Order Passeriformes cont'd						
Brown-capped rosy finch	Leucosticte australis	R	M	R-U	C-O	
Pine siskin	Spinus pinus	R,PP	SR,WR	R-U	C-I	Breeds
American goldfinch	Spinus tristis	G/S, PJ,R	SR,WR	R	C-O	Breeds
*Lesser goldfinch	Spinus psaltris	R	SR,WR	R-F	C-I	Breeds
Lawrence's goldfinch	Spinus lawrencei	R	SR,WR	R	X	
*Red crossbill	Loxia curvirostra	PP	M	R-C	I	
Green-tailed towhee	Pipilo chlorurus	G/S,R	SR,M	R-C	I-R	
*Rufous-sided towhee	Pipilo erythrophtalmus	PJ,R, G/S	SR,WR	R-C	I-R	Breeds
*Brown towhee	Pipilo fuscus	G/S,PJ	SR,WR	U	O-I	Breeds
*Lark bunting	Calamospiza melanocorys	G/S	M	R	C	
*Savannah sparrow	Passerculus sandwichensis	G/S	M	R-U	C	
*Vesper sparrow	Pooecetes gramineus	G/S	SR,M	R-C	I-R	Breeds
*Lark sparrow	Chondestes grammacus	G/S,PJ	SR,M	U-C	C-R	Breeds
Cassin's sparrow	Aimophila cassinii	G/S	M,SR	R	C	
*Black-throated sparrow	Amphispiza bilineata	G/S	SR	C	I-R	Breeds
*Sage sparrow	Amphispiza belli	G/S	SR,WR	R-F	C-O	Breeds
*Dark-eyed junco	Junco oreganus	PJ,PP, R	WR	U-A	I-R	
*Gray-headed junco	Junco caniceps	PJ,PP	YR	U-C	O-R	Breeds
Tree sparrow	Spizella arborea	G/S,R	WR	R-E	O-I	
*Chipping sparrow	Spizella passerina	PJ,R, PP	SR	F-C	C-R	Breeds
*Brewer's sparrow	Spizella breweri	G/S	SR	U-C	I-R	Breeds
Harris' sparrow	Zonotrichia guerula	G/S	WR,M	R-U	C-I	
*White-crowned sparrow	Zonotrichia leucophrys	G/S,R, PJ	WR	U-C-A	I-R	

Table 2. (continued)

ORDER - COMMON NAME	SCIENTIFIC NAME	HAB-ITAT[1/]	SEA-SON[2/]	ABUN-DANCE[3/]	FRE-QUENCY[4/]	ADDIT'L REMARKS
Order Passeriformes cont'd						
White-throated sparrow	*Zonotrichia albicollis*	G/S	M	R-U	C-I	
Fox sparrow	*Passerella iliaca*	G/S,R	M	R	X	
Lincoln's sparrow	*Melospiza lincolnii*	G/S,R	W	R-F	C	
*Song sparrow	*Melospiza melodia*	R	WR	R-U	C-I	
Lapland longspur	*Calcarius lapponicus*	G/S	M	R	X	

SECTION 6 - REPTILES AND AMPHIBIANS

Caudata (salamanders)

Only one species of salamander is found within the inventory area, the ubiquitous tiger salamander (Ambystoma tigrinum). According to Harris (1963, 1967), Jones (1970), Gehlback (1965) and Stebbins (1966), the species occurs in permanent or semipermanent bodies of water, at any altitude in New Mexico. This is reflected in the wide range of habitats it has been collected in throughout the area.

Anura (toads and frogs)

Most of the anurans found within the area occur in habitats associated with permanent water. The spadefoot toads, however, are highly adapted to desert conditions and have been found throughout the dry desert grassland and pinon-juniper woodland. The western spadefoot toad (Scaphiopus hammondi), and plains spadefoot toad (Scaphiopus bombifrons) are widespread, although these species are usually found in washes affiliated with short grass/desert shrub habitats, and have not been recorded north of the San Juan River. A third species, the Great Plains spadefoot toad (Scaphiopus intermontanus), also may occur within the area south of the San Juan River.

Woodhouse toad (Bufo woodhousei) is commonly distributed from riparian to ponderosa pine forest wherever permanent water is present. The red-spotted toad (Bufo punctatus) also inhabits permanent pools in desert grassland and pinon-juniper habitat and is less commonly found along rivers (Harris, 1967). This species has only been recorded in the extreme south portion of the study area and in Chaco Wash. Although the western toad (Bufo boreas) has not been recorded in the area, it is believed the species could occur in the vicinity of Pine River at the extreme northern boundary of the inventory area.

In addition to Woodhouse toad, the bullfrog (Rana catesbeiana), leopard frog (Rana pipiens), and chorus frog (Pseudacris triseriata), can be found along the San Juan River. The bullfrog was apparently introduced to the San Juan drainage (Stebbins, 1954) and has become sufficiently abundant to permit a regulated harvest. The chorus frog has never been collected from the San Juan River drainage. However, Harris (1963) heard a call there, and it is probably present in the San Juan Valley based on the habitat description prepared by Stebbins (1966). This species and the leopard frog have been recorded in the Zuni Mountains and Mt. Taylor area by Gehlbach (1965). The canyon treefrog (Hyla arenicolor) has been found in rocky canyon pools associated with riparian vegetation, pinon-juniper and ponderosa pine habitat.

Chelonia (turtles)

Two species of turtles are found on the area; the painted turtle (Chrysemys picta), and the western box turtle (Terrapene ornata). According to Degenhardt and Christiansen (1974), the western box turtle has, in all probability, been introduced to the area. All records of this species in New Mexico have been reported in areas of heavy tourist use. The painted turtle inhabits aquatic environments and is common in pools along the San Juan River, mostly below 5,000 feet elevation (Degenhardt and Christiansen, op. cit.).

Squamata (lizards and snakes)

Within the area, the highest diversity and abundance of lizards is found in rocky areas or habitat associated with sandy soils. There are two species which are widespread geographically and ecologically; the short-horned lizard (Phrynosoma douglassi) and the plateau whiptail (Cnemidophorus velox). Although the short-horned lizard is not abundant, it occurs from desert to pine forest (Harris, 1963 and 1967; Gehlbach, 1965). The short-horned lizard is apparently absent only in riparian habitats and areas of high topographic relief (Harris, 1963).

The plateau whiptail, one of three species of whiptail lizards occurring in the area, can be found from the edge of riparian areas to ponderosa pine forests. It is most common, however, in flat, open areas of lower elevation pinon-juniper woodland (Harris, 1963; 1967; Gehlbach, 1965; Wright and Lowe, 1968; Wright, 1968). The western whiptail (Cnemidophorus tigris) and the little striped whiptail (Cnemidophorus inornatus) are less abundant in the area and are found only in San Juan County, New Mexico. Both species frequent areas of sandy soils; however, the western whiptail prefers sparsely vegetated areas in the vicinity of washes, whereas the little striped whiptail is always associated with grassland habitat south of the San Juan River (Harris, 1963; Wright, 1968 and Christiansen, et al, 1971). Similarly, the lesser earless lizard (Holbrookia maculata) is fairly restricted to sandy grassland areas south of the San Juan River (Harris, 1963). The sagebrush lizard (Sceloporus graciosus), while preferring sandy soils and avoiding rocky areas, is common and widespread in shrubby areas (Harris, 1963; and Jones, 1970).

The collared lizard (Crotophytus collaris) and eastern fence lizard (Sceloporus undalatus) are quite abundant and widespread throughout the area. The collared lizard is usually found in association with rocky, boulder-strewn areas in pinon-juniper and desert shrub habitat, where vegetation is sparse (e.g., Harris, 1963; Gehlbach, 1965). The eastern fence lizard, while occurring throughout the habitat types found within the inventory area, is most abundant in rocky areas.

The side-blotched lizard (Uta stansburiana), although commonly distributed throughout the area, is found only below pinon-juniper woodland. According to Harris (1967) and Tinkle (1967), the side-blotched lizard appears to avoid wooded areas, and McKinney (1971) has proposed a 6,000 foot elevation as the upper distributional limit for its occurrence.

There are three lizard species found in the area which occur mainly or only in the Zuni Mountains and Mt. Taylor area. The tree lizard (Urosaurus ornatus), while found in low densities in Chaco Canyon and Chaco Wash, is common in the rocky edges and cliffs within the pinon-juniper and ponderosa pine forests of the Zuni foothills. Gehlbach (1965) claims, however, that this species is not tree dwelling in that area. The Great Plains skink (Eumeces obsoletus), is found only in the Zuni Mountains and Mt. Taylor area and occurs in rocky areas associated with pinon-juniper and ponderosa pine. According to Gehlbach (1965), the Great Plains skink probably does not occur any further north than the Mt. Taylor area. The many-lined skink (Eumeces multivirgatus) is primarily found in areas of heavy deciduous growth and occasionally in pinon-juniper and ponderosa pine habitat (Gehlbach, 1965). Although there are no records for the leopard lizard (Crotaphytus wislizenii), Stebbins (1966) includes the entire inventory area as within the range of this species. Stebbins (op. cit.) also shows the desert spiny lizard (Sceloporus magister) as occurring in the northern half of the area.

Records of snakes found within the inventory area are especially scant. Accordingly, abundance and distribution can only be interpreted through the limited herpetofauna studies performed in northwestern New Mexico.

There are three snake species which are clearly widespread throughout the area: the gopher snake, (Pituophis melanoleucus); the western rattlesnake (Crotalus viridis) and the western terrestrial garter snake (Thamnophis elegans). The gopher snake, is, by far, the most common snake in the overall vicinity. It is especially widespread in non-rocky, gently sloping areas of low elevation vegetated areas. The western terrestrial garter snake is common in areas of permanent and semi-permanent water of all vegetative types and, on occasion, is found away from water (Harris, 1963; 1967; Fleharty, 1967; Gehlbach, 1965). The western rattlesnake is found in all major habitats, but is fairly uncommon. The Hopi rattlesnake (Crotalus viridis nuntius), which is a subspecies of the western rattlesnake, could conceivably occur within the area, although Gehlbach (1967) and Klauber (1956) both state that integrades between (Crotalus v. viridis), (C. v. nuntius) and (C. v. concolor) probably occur in the San Juan Basin.

The Hopi rattlesnake is used extensively for ceremonial purposes by the Hopi Indians of northwestern Arizona who often travel great distances to collect this subspecies.

Two other species of rattlesnakes, the black-tailed rattlesnake (Crotalus molossus) and the western diamondback rattlesnake (Crotalus atrox), occur only in the Mt. Taylor area. Gehlbach (1965) claims that Mt. Taylor is probably the most northwest limit for the western diamondback. Similarly, the coachwhip (Masticophis flagellum) has only been found in the Mt. Taylor area in lower pinon-juniper habitat (Gehlbach, op. cit.). The striped whipsnake (Masticophis taeniatus) is possibly widespread; however, Jones (1970), states that it is difficult to collect. This species has been collected in diverse localities, mainly in pinon-juniper woodland and denser brushy areas (Harris, 1963; Gelhbach, 1965). The night snake (Hypsiglena torquata) frequents a variety of habitats in its western range (Stebbins, 1966), but has been taken only at Chaco Canyon and Thoreau, New Mexico (Jones, 1970; and Gehlbach, 1965). The glossy snake (Arizona elegans) has been collected only in San Juan County south of the San Juan River. It apparently can be found in sandy soils near washes in lower vegetation types (Harris, 1963; 1967; Jones, 1970). The ringneck snake (Diadophis punctatus), a secretive snake, has been recorded only in the Zuni Mountains and Mt. Taylor area near small streams (Gehlbach, 1965).

There are three species of snakes which have not been recorded within the area, but warrant mentioning because of their proximity to the area. The smooth green snake (Opheodrys vernalis) has been collected approximately 25 miles east of the inventory area, near Cuba, New Mexico (T. Brown, personal communication). Harris (1963) stated that this species could also occur in the vicinity of Navajo Dam. According to Gehlbach (1965), the northernmost range for the mountain patch-nosed snake (Salvadora grahamiae) is ten miles south of Grants, New Mexico in cholla-juniper habitat. The milk snake (Lampropeltis triangulum) has been collected in extreme southern Colorado and Harris (1963) believes this species may also occur in the Pine River Canyon area.

A list of the herpetofauna found within the inventory area, and their preferred habitat is given in Table 3.

Table 3. Herpetofauna and habitat preference within the wildlife inventory area

COMMON NAME	SCIENTIFIC NAME	HABITAT TYPE 1/ R	G/DS	P/J	P
Tiger salamander	Ambystoma tigrinum*	X	X	X	X
Western spadefoot	Scaphiopus hammondi*	X	XX	X	
Plains spadefoot	Scaphiopus bombifrons*	X	XX		
Red-spotted toad	Bufo punctatus	X	X		
Woodhouse's toad	Bufo woodhousei*	X	X	X	X
Chorus frog	Pseudacris triseriata	X	X	X	X
Canyon treefrog	Hyla arenicolor			X	X
Bullfrog	Rana catesbeiana	X			
Leopard frog	Rana pipiens	X			
Painted turtle	Chrysemys picta	X			
Western box turtle	Terrapene ornata**				
Lesser earless lizard	Holbrookia maculata*		X		
Collared lizard	Crotophytus collaris*		X	X	
Eastern fence lizard	Sceloporus undulatus*	X	X	X	X
Sagebrush lizard	Sceloporus graciosus*		X	X	
Side-blotched lizard	Uta stansburiana*		X		
Tree lizard	Urosaurus ornatus		X	X	X
Short-horned lizard	Phrynosoma douglassi*		XX	XX	X
Great Plains skink	Eumeces obsoletus			XX	X
Many-lined skink	Eumeces multivirgatus	XX		X	X
Western whiptail	Cnemidophorus tigris	X	X	X	
Plateau whiptail	Cnemidophorus velox*	X	X	X	

1/ Key to distribution and habitat preferences
* common and widespread
** introduced in areas of high tourist use
R Riparian
G/DS grassland/desert shrub
P/J pinon/juniper
P Ponderosa pine forest

Table 3. (continued)

COMMON NAME	SCIENTIFIC NAME	HABITAT TYPE 1/ R	G/DS	P/J	P
Little striped whiptail	Cnemidophorus inornatus		X		
Ringneck snake	Diadophis punctatus			X	X
Coachwhip	Masticophis flagellum			X	
Striped whipsnake	Masticophis taeniatus		X	X	
Gopher snake	Pituophis melanoleucus*	X	X	X	X
Glossy snake	Arizona elegans		X		
Black-necked garter snake	Thamnophis cyrtopsis	X			
Western terrestrial garter snake	Thamnophis elegans*	X	X	X	X
Night snake	Hypsiglena torquata			X	
Black-tailed rattlesnake	Crotalus molossus			X	X
Western rattlesnake	Crotalus viridis*		X	X	X
Western diamondback rattlesnake	Crotalus atrox			X	
Possibly occurring in vicinity:					
Great Plains spadefoot	Scaphiopus intermontanus		X	X	
Western toad	Bufo boreas	X			
Leopard lizard	Crotophytus wislizenii		X		
Desert spiny lizard	Sceloporus magister	X	X	X	
Smooth green snake	Opheodrys vernalis	X			
Mountain patch-nosed snake	Salvadora grahamiae			X	
Milk snake	Lampropeltis triangulum				X

SECTION 7 - FISH AND OTHER AQUATICS

Since there are significant and sometimes unique differences between the permanent rivers, lakes, and reservoirs within the inventory area, they are discussed as separate aquatic environments with their associated fisheries.

San Juan River

The San Juan River is the second largest tributary stream of the upper Colorado River. It originates in the San Juan Mountains of southwestern Colorado, west of the Continental Divide. Navajo Dam, located about 15 miles northeast of Blanco, New Mexico, regulates the volume of river flow for approximately 180 miles downstream where the river enters the San Juan arm of Lake Powell.

The San Juan is a rather large, complex and sensitive river ecosystem. Much of the aquatic fauna is dependent on the natural enrichment of the soil and water of the watershed. The river harbors a variety of fish species, which are native or have been introduced into the drainage system. Native fishes present in the river reflect species which have evolved and adapted to ecological conditions characteristic of the upper Colorado River system. Table 4 lists the fish species found in the San Juan River.

The assembly of dams and competition from introduced fish has reduced numbers and distribution of native fish species. Minckley and Deacon (1968) attribute these declines largely to man's modification of various aquatic environments. The lowering of water tables, subtle physical or chemical changes, and other pollutional effects have accelerated the extirpation of remnant fish populations. Even with these changes in the environment, some native fishes have been able to adapt and sustain a population in the river. These endemic species include: the bluehead sucker, (*Catostomus discobolus*); flannelmouth sucker, (*Catostomus latipinnis*); speckled dace (*Rhinichthys osculus*); mottled sculpin, (*Cottus bairdi*); and the roundtail chub, (*Gila robusta*).

Prior to impoundment of Navajo Reservoir in 1962, the San Juan River was characterized as a warm and turbid stream (Olson, 1962). Considerable change in water quality and temperature occurred in the first eight miles of the river as a result of the construction of Navajo Dam. Maximum surface water temperatures were reduced from 76°F to 60°F and the minimum temperature increased from 33°F to 40°F (Graves and Haines, 1969). Turbidity was reduced considerably resulting in a clear and cool stream. These water quality conditions became favorable to sustain a coldwater fishery in the tailwaters from Navajo Dam to Largo Canyon, a distance of about 15 miles downstream.

TABLE 4 - Fish species known to occur in the San Juan River, New Mexico

COMMON NAME	SCIENTIFIC NAME	STATUS
Rainbow trout	*Salmo gairdneri*	Introduced
Brown trout	*Salmo trutta*	Introduced
Northern pike	*Esox lucius*	Introduced
Carp	*Cyprinus carpio*	Introduced
*Bonytail chub	*Gila elegans*	Native
Roundtail chub	*Gila robusta*	Native
Red shiner	*Notropis lutrensis*	Introduced
Fathead minnow	*Pimephales promelas*	Introduced
Colorado River squawfish	*Ptychocheilus lucius*	Native
Speckled dace	*Rhinichthys osculus*	Native
White sucker	*Catostomus commersoni*	Introduced
Flannelmouth sucker	*Catostomus latipinnis*	Native
Bluehead sucker	*Catostomus discobolus*	Native
*Razorback sucker	*Xyrauchen texanus*	Native
Black bullhead	*Ictalurus melas*	Introduced
Channel catfish	*Ictalurus punctatus*	Introduced
Rio Grande killifish	*Fundulus zebrinus*	Introduced
Mosquitofish	*Gambusia affinis*	Introduced
Green sunfish	*Lepomis cyanellus*	Introduced
Bluegill	*Lepomis macrochirus*	Introduced
Largemouth bass	*Micropterus salmoides*	Introduced
Mottled sculpin	*Cottus bairdi*	Native

* Presence unconfirmed

The sport fishery of the San Juan River has consisted primarily of a "put, grow and take" fish stocking program. The New Mexico Department of Game and Fish has stocked both rainbow trout (Salmo gairdneri) and brown trout (Salmo trutta) in the tailwaters area. In recent years, however, they have planted only rainbow trout. Food organisms such as mayflies, caddis flies, stoneflies, and snails, are abundant in the river and play an important role in the growth and production of these trout. Because of the good growth rates that trout have achieved, a section of the river below Navajo Dam has been designated as "Quality Trophy Fishing Waters." The 2.75 mile stream section limits fishermen to use only artifical lures and flies, with a 15-inch minimum size limit and a four trout daily bag limit. The remainder of the river is open to various angling gear, with no size limit and an eight trout daily possession limit.

Fingerling trout have exhibited growth rates up to one inch per month during the first few months following introduction (Graves and Haines, 1969). The tailwaters of the San Juan River have produced rainbow trout exceeding 11 pounds and brown trout over 10 pounds.

The section of the San Juan River beginning from the State Highway 64 bridge one mile east of Blanco, New Mexico, downstream to the New Mexico-Colorado State line can be considered a marginal sport fishery at best. The water is often turbid and the river bottom is silt laden. Non-game fish, such as carp (Cyprinus carpio), black bullhead (Ictalurus melas), fathead minnow (Pimephales promelas), roundtail chub, speckled dace, flannelmouth, bluehead and western white sucker (Catostomus commersoni) inhabit this section of the river. Channel catfish (Ictalurus punctatus), although not numerous, comprise the majority of the angling pressure in this section of the river. Water temperatures, which normally range in the mid 70's during the summer, and turbidity tend to discourage salmonid species from inhabiting this section of the river.

Animas River

The Animas River is a major tributary to the San Juan River. The river originates near the abandoned community of Animas Fork, Colorado at an elevation of 11,000 feet. It flows a distance of 42 miles before entering the State near Cedar Hill, New Mexico. Elevation of this lower stretch averages 5,930 feet.

The Animas River is used primarily for irrigation, although the river also serves as a water supply for Aztec and Farmington, New Mexico.

Most fishing use is restricted to the 42 mile stretch of river above the state line. Smith (1976) explains that most angler use occurs in the stretch of river between Baker's Bridge (approximately 12 miles north of Durango), and Durango, Colorado. Catchable size rainbow trout provide the greater portion of the sport fishing recreation on the Animas River. Brown trout, and occasionally cutthroat trout (Salmo clarki) and brook trout (Salvelinus fontinalis) are also occasionally caught in the river. Catchable size rainbow trout and fingerling brown trout are planted in the river from a Colorado state fish hatchery located in Durango, Colorado.

Table 5 lists the fish species collected in the Colorado portion of the Animas River drainage during a fishery investigation conducted during 1975 and 1976 (Smith, 1976) and those fish known to inhabit the river, but not sampled during the recent fishery survey.

The sport fishery from the New Mexico state line downstream to the confluence with the San Juan River at Farmington, New Mexico can be considered marginal, at best (Olson, 1962). Brown trout, rainbow trout, and channel catfish are caught occasionally in the vicinity of Cedar Hill, New Mexico.

La Plata River

The La Plata River originates at 11,620 feet in the La Plata Mountains of southwestern Colorado. The river flows in a southerly direction for an estimated 40 miles before entering New Mexico. Numerous small tributary streams, which are located in the La Plata Mountains of Colorado, contribute to its flow. In New Mexico, the river flows through approximately 20 miles of private farmlands before entering the San Juan River just west of Farmington, New Mexico.

Much of its flow is utilized for irrigation of farmlands along the river valley in Colorado and New Mexico. Diversion of the lower river into various irrigation ditches and canals becomes so intensive during the growing season that much of the main stream becomes dry, particularly from the New Mexico state line downstream to the confluence with the San Juan River.

The La Plata fishery is representative of tributary streams associated with the upper Colorado River drainage and the following species are typical of the river system (Smith, 1976); rainbow trout, brown trout, brook trout, cutthroat trout, flannelmouth sucker, bluehead sucker, speckled dace, fathead minnow, and mottled sculpin (Cottus bairdi).

TABLE 5 - Fish species known to occur in the Animas River, Colorado and New Mexico

COMMON NAME	SCIENTIFIC NAME	STATUS
Rainbow trout	*Salmo gairdneri*	Introduced
Brown trout	*Salmo trutta*	Introduced
Brook trout	*Salvelinus fontinalis*	Introduced
Cutthroat trout	*Salmo clarki*	Native
Kokanee salmon	*Oncorhynchus nerka*	Introduced
*Northern pike	*Esox lucius*	Introduced
*Channel catfish	*Ictalurus punctatus*	Introduced
*Largemouth bass	*Micropterus salmoides*	Introduced
*Yellow perch	*Perca flavescens*	Introduced
*Bluegill	*Lepomis macrochirus*	Introduced
*Green sunfish	*Lepomis cyanellus*	Introduced
Flannelmouth sucker	*Catostomus latipinnis*	Native
Bluehead sucker	*Catostomus discobulus*	Native
White sucker	*Catostomus commersoni*	Introduced
Speckled dace	*Rhinicthys osculus*	Native
Fathead minnow	*Pimephales promelas*	Introduced
Mottled sculpin	*Cottus bairdi*	Native

* Fish species not collected during 1975-1976 fishery survey.

Most of the fish stocking program is restricted to the headwaters in Colorado. Consequently, almost all the fisherman use is limited to public lands in Colorado, with little, if any, angler use occurring in New Mexico.

As with most rivers that flow over a wide range in elevation and habitat types, the La Plata River exhibits definite changes in aquatic invertebrate diversity and abundance as it progresses downstream. From a cold, clear stream in the headwaters and mountainous terrain where such aquatic invertebrates as mayflies, stoneflies, and caddis flies predominate, it gradually becomes sluggish and turbid at lower elevations and insect diversity shifts to water dipterans, water beetles, damsel flies and dragon fly larvae.

Water quality from the New Mexico state line downstream reflects degradation as a result of intensive agricultural use and reduced water flows (Smith, 1976).

Navajo Dam and Reservoir

Navajo Dam, which is located approximately 15 miles northeast of Blanco, New Mexico, is part of the upper Colorado River Storage Project authorized by Congress in 1956. At normal operational pool, the reservoir has a surface area of 15,610 acres and stores 1,709,000 acre-feet of water. When full, Navajo Reservoir inundates approximately 35 miles of the San Juan River and 15 miles of the Los Pinos River backing water approximately 10 miles into Colorado (Olson and McNall, 1965). Much of the area surrounding the reservoir is pinon-juniper. There are areas, however, where ponderosa pine and small stands of douglas fir and aspen exist.

During 1961, the New Mexico Department of Game and Fish conducted a preimpoundment fishery investigation in the reservoir basin of the San Juan River (Olson, 1962). The fishery of the San Juan River was sampled using rotenone, a fish toxicant. The objective of the project was to reduce the number of non-game or rough fish present in the reservoir basin. Non-game fish species accounted for approximately 93% of the fish sampled during the study. These included such native species as the bluehead sucker, flannelmouth sucker, Colorado River squawfish (*Ptychocheilus lucius*), mottled sculpin, speckled dace, and the roundtail chub. Other non-game fish taken during the preimpoundment study included the white sucker, black bullhead, fathead minnow, green sunfish (*Lepomis cyanellus*), and carp. Brown trout, and channel catfish, comprised the remaining seven percent of fish sampled during the study.

During the initial filling of Navajo Reservoir, the sport fishery was composed almost exclusively of rainbow trout. Following the introduction of trout, channel catfish, bluegill (Lepomis macrochirus), and kokanee salmon (Oncorhynchus nerka) were stocked in the lake. Kokanee were not observed in the Los Pinos River or the upper San Juan River until fall of 1968. Since then, fishermen have enjoyed angling for this species, which has added to the diversity of the sport fishing program in the reservoir.

The rainbow trout fishery has undergone changes in productivity and growth rates throughout several years (Olson, 1967). During the early and mid-sixties, slow-growth rates were achieved. This condition was attributed primarily to the lack of available food supply in the lake and inter-species competition with roundtail chubs, which at that time were numerous in the lake.

Post-impoundment fishery investigations from 1963 through 1967 showed that Navajo Lake could be utilized as a two-story reservoir fishery. The New Mexico Department of Game and Fish felt that various areas of the lake could be occupied both by coldwater and warmwater fish. Essentially, the shallow coves with their inundated large trees could be inhabited by largemouth bass (Micropterus salmoides), white crappie (Pomoxis annularis), and bluegills. Many non-game species, such as small suckers, chubs, carp, and bluegills, would serve as a food source for these larger predacious fish (Olson, 1967, and Graves and Haines, 1969). Trout, on the other hand, would occupy the open colder waters (pelagic) areas, including flooded side canyons, for feeding on planktonic and other aquatic organisms.

During recent years, the stocking program has been restricted to rainbow trout and kokanee salmon. Approximately 1.2 million rainbow trout fry are stocked annually in Navajo Lake. An estimated 100,000 to 500,000 kokanee salmon fry are also stocked annually. The number of salmon stocked each year depends, to a large extent, upon the availability of hatchery-produced fish.

Cutter Lake

Cutter Lake is situated approximately 12 miles southeast of Blanco, New Mexico. Cutter Dam was constructed for the purpose of regulating water flows for the Navajo Indian Irrigation Project and the reservoir and canal system have been in operation since March of 1976.

Cutter Lake has a surface area of approximately 62 acres, storage capacity of 1720 acre-feet of water and maximum depth of 75 feet at the dam. Water is diverted into the lake from Navajo Reservoir via canal.

Fishery management of the lake began in 1971, with the sport fishery being comprised exclusively of rainbow trout. Management of the lake, however, has been neglected during recent years due to jurisdictional and land management conflicts. Confirmed observations were made of black bullheads and bluegills being present in the lake (Sanchez, 1975). It is conceivable that any of the fish species occurring in Navajo Reservoir could also be found in Cutter Lake; a fish screening device was not incorporated during original construction of the intake canal, but has since been installed across the spillway of the dam to prevent downstream movement of fish.

Farmington Lake

Farmington Lake is located approximately one mile north of U.S. Highway 550 northeast of Farmington, New Mexico. The lake is also referred to as Beeline Reservoir, because of its proximity to the Beeline Gas Refinery. Elevation of the reservoir is 5,620 feet.

Lake Farmington has a surface area of approximately 140 acres with a storage capacity of 4,080 acre-feet of water. Water to the lake is derived from surface runoff and from the Animas River via a concrete lined ditch. The principle purpose for construction of the lake was to provide additional water supply for the city of Farmington.

Fish stocking records show the following fish planted in the lake; largemouth bass, channel catfish, white crappie, bluegill, and rainbow trout (Little, 1968). Population sampling during 1968 also revealed the presence of flannelmouth suckers, and white suckers.

Farmington City Lake

Farmington City Lake is located within city limits just north of 20th Street between Butler and Dustin Streets. The lake is approximately four surface acres, with a maximum depth of 51 feet and an average depth of three feet.

The lake was open to fishing during the early 1960's with the stipulation that fishing be limited to children only. The lake is managed principally as a warmwater fishery. Fish stocking during 1963-1964 consisted of 200 largemouth bass, 2,000 bluegill and 150 channel catfish (Davies, 1965).

Based on a fishery survey conducted by Davies, 1965, it is expected that the following species occur in the lake: largemouth bass, bluegill, channel catfish, western white sucker, flannelmouth sucker, fathead minnow, mosquitofish, and possibly black bullheads.

Jackson Lake

Jackson Lake is located approximately 10 miles northwest of Farmington and one-half mile west of State Highway 17. At maximum storage capacity, the lake covers an estimated 60 surface acres with 900 acre-feet of water (Olson, 1962). The water supply originates from the La Plata River and flows four miles through a man-made ditch to the lake.

The Jackson Lake fishery is represented by several game and non-game fish species (Olson, 1962). Game or sport fish species include: rainbow trout, largemouth bass, bluegill, white crappie, and channel catfish. Non-game species include: flannelmouth sucker, carp, black bullhead, fathead minnow, and the mosquitofish. Non-game fish make up the majority of the fish population in Jackson Lake.

Aquatic vegetation is common in the lake and surrounding shoreline. As a result, aquatic invertebrates such as water dipterans, water boatmen, and dragon fly larvae, are abundant and provide an excellent food source for growth and production.

Bluewater Lake

Bluewater Lake is located at the end of State Highway 412 approximately 20 miles northwest of Grants, New Mexico. At spillway level, the lake covers an estimated 3,021 surface acres and a volume of 43,000 acre-feet of water.

Bluewater and Cottonwood Creeks are normally intermittent streams with flows reaching the lake only during spring runoff and high intensity rainfall during the summer. A minimum storage pool of 320 surface acres and a maximum depth of 20 feet has been established in order to support a year-round fishery (Regan, 1962). The lake generally averages 7,500 acre-feet of water annually.

The sport fishery consists primarily of rainbow trout. McNall (1969) reports the following species also present; brown trout, channel catfish, largemouth bass, fathead minnow, white sucker, Rio Grande mountain sucker (*Catostomus plebius*), Rio Grande chub (*Gila nigrescens*), and Central plains killifish (*Fundulus kansae*).

A crayfish (*Orconectes causeyi*) was introduced into the lake during the 1950's to control excessive aquatic plant growth. Numerous aquatic insects, such as water striders, water boatmen, dragon fly and damsel fly larvae, provide a food source for fish and other aquatic organisms.

SECTION 8 - ARTHROPODS

Terrestrial

Reliable data on terrestrial arthropods were not available for the entire inventory area; however, such data were available for San Juan County, New Mexico and are generally considered applicable to the entire area.

The arthopods of San Juan County were inventoried in 1973 and 1974 by Battelle-Columbus Laboratories for the WESCO Coal Gasification Project. Terrestrial insects were sampled by net sweeps along established transects, and by observation (ant hills) along ground transects. Collection sites were divided into habitat types: (1) shortgrass/desert shrub (SG/DS), (2) pinon-juniper (P/J), (3) riparian (R), and (4) airborne aquatics (A).

The dominant insects observed were true bugs (Hemiptera), cicadas, hoppers, and aphids (Homoptera), beetles (Coleoptera), flies (Diptera), and wasps, bees, and ants (Hymenoptera). The only desert order not sampled were grasshoppers (Orthoptera), which was attributed primarily to sampling techniques. A complete list of the orders and families identified during the inventory is given in Table 6. The relative abundance of insects by habitat is given in Table 7.

The highest diversity and abundance of terrestrial arthopods was observed in riparian habitat, with the lowest density of insects occurring in the shortgrass/desert shrub habitats. The lack of appreciable precipitation and overgrazing in the shortgrass/desert shrub community has resulted in decreased insect diversity and densities. Flies (Diptera) were the most numerous insect present in the shortgrass/desert shrub association. In pinon-juniper habitat, true bugs were the most numerous insect, followed by beetles, cicadas, hoppers, and aphids. Riparian and aquatic airborne insects were represented by flies and damselflies, respectively.

Significant numbers of grasshoppers (Orthoptera) would be expected to occur in shortgrass/desert shrub habitat. However, grasshopper densities are often dependent on the climatic conditions of the area. Harvester ants (Hymenoptera) also are numerous in shortgrass/desert shrub habitat, with some areas containing over five colonies (hills) per acre.

The most common forest insects within the area are beetles, moths, and butterflies (Lepidoptera), wasps, flies, scale insects, and termites (Isoptera) (Keen, 1952). As would be expected, the terrestrial insects most understood are those which damage forest plants. In pinon-juniper habitat, aphids, scale insects, spittlebugs, needle miners and bark beetles are considered the

Table 6. Orders and families of arthropods collected in the proximity of the wildlife inventory area in 1973 and 1974.*

ORDER	FAMILY
Odonata - Dragonflies and Damselflies	Coenagrionidae - narrow-winged damselflies
Orthoptera - Grasshoppers	Acrididae - short-horned grasshoppers
	Tettigoniidae - long-horned grasshoppers
Thysanoptera - Thrips	Phloeothripidae
Hemiptera - True Bugs	Miridae - leaf bugs
	Phymatidae - ambush bugs
	Nabidae - damsel bugs
	Tingidae - lace bugs
	Lygaeidae - chinch bugs
	Coreidae - leaf-footed bugs
	Scutelleridae - shield-backed bugs
	Pentatomidae - stink bugs
Homoptera - Cicadas, Hoppers, Aphids	Cicadidae - cicadas
	Membracidae - treehoppers
	Cicadellidae - leafhoppers
	Fulgoridae - planthoppers
	Delphacidae - planthoppers
	Dictyopharidae - planthoppers
	Cixiidae - planthoppers
	Psyllidae - jumping plant lice
	Aphididae - aphids
Coleoptera - Beetles	Cicindelidae - tiger beetles
	Carabidae - ground beetles
	Malachiidae - soft-winged flower beetles
	Meloidae - blister beetles
	Mordellidae - tumbling flower beetles

*Collected by Battele-Columbus Laboratories, unpublished study for WESCO, 1974.

Table 6. (continued)

ORDER	FAMILY
	Tenebrionidae - darkling beetles
	Anobiidae - drugstore beetles
	Cerambycidae - long-horned beetles
	Chrysomelidae - leaf beetles
	Curculionidae - weevils
Neuroptera - Lacewings	Chrysopidae - common lacewing
Lepidoptera - Butterflies and Moths	Pieridae - whiles and sulfurs
	Nymphalidae - brush-footed butterflies
	Sphingidae - sphinx or hawk moths
	Noctuidae - underwings, cutworms, dagger moths
Diptera - Flies	Culicidae - mosquitos
	Chironomidae - midges
	Anisopodidae - wood gnats
	Stratiomyidae - soldier flies
	Tabanidae - horse and deer flies
	Acroceridae - small-headed flies
	Asilidae - robber flies
	Bombyliidae - bee flies
	Dolichopodidae - long-legged flies
	Syrphidae - flower flies
	Otitidae - picture-winged flies
	Tephritidae - fruit flies
	Sepsidae - black scavenger flies
	Drosophilidae - small fruit flies
	Chloropidae - fruit flies
	Trioxscelidae - trioxscelid flies
	Anthomyiidae - anthomyiid flies
	Muscidae - house flies
	Gasterophilidae - horse bot flies
	Calliphoridae - blow flies
	Tachinidae - tachinid flies

Table 6. (continued)

ORDER	FAMILY
Hymenoptera - Bees, Wasps, Ants	Braconidae - braconids
	Icheumonidae - icheumonids
	Chalcididae - chalcidids
	Cynipidae - gall wasps
	Chrysididae - cuckoo wasps
	Mutillidae - velvet ants
	Formicidae - ants
	Vespidae - paper wasps
	Colletidae - yellow-faced bees
	Andrenidae - mining bees
	Halictidae - mining bees
	Megachilidae - leafcutting bees
	Apidae - mining, digger, and honey bees
Araneida - Spiders	Thomisidae - crab spiders
	Salticidae - jumping spiders
	Tetragnathidae - four-jawed spiders

Table 7. Relative abundance of insects by habitat 1/
San Juan County, New Mexico 2/

ORDER		HABITAT 3/ SG/DS	P/J	R	A
Odonata	- Damselflies and dragonflies				C
Orthoptera	- Grasshoppers	U	I	I	C
Thysanoptera	- Thrips			I	
Hemiptera	- True bugs	C	U	U	A
Homoptera	- Cicadas, hoppers, aphids	C	C	C	A
Neuroptera	- Lacewings	I	I	I	
Coleoptera	- Beetles	C	C	U	C
Lepidoptera	- Butterflies, moths	C	U	I	I
Diptera	- Flies	C	C	F	A
Hymenoptera	- Bees, wasps, ants	C	U	C	A

1/ I = infrequent = 1-2 individuals
U = uncommon = 3-8 individuals
C = common = 9-23 individuals
F = frequent = 24-60 individuals
A = abundant = 61-760 individuals
based on number collected per 1000 net sweeps.

2/ information compiled from DOI publication FES 76-2 (WESCO), 1976.

3/ SG/DS = short grass/desert shrub
P/J = pinon-juniper
R = riparian
A = airborne over aquatics

principal pest insects (Hantsbarger et al, 1970). Problem insects most often associated with ponderosa pine forests are wasps, bark and cone beetles, and tip moths (Pearson, 1949). As a point of interest, during 1967, 48.1% of the ponderosa pine seed production was destroyed in Cibola and Carson National Forests by forest pest insects. These national forests are located within and adjacent to the inventory area. Insects responsible for seed destruction are seed chalcids, pine cone beetles, pine cone moths, and cecidomylidae larvae (Kinzer, H.G., et al, 1972).

Aquatic

Graves (1967) conducted a study of the aquatic invertebrates in the San Juan River beginning from January 1, 1963 through December 31, 1965. Monthly samples were obtained by use of a Surber square-foot bottom sampler. Aquatic organisms were collected and preserved in 10% formalin solution.

Table 8 lists the aquatic invertebrates sampled in the San Juan, Animas, and La Plata Rivers. Graves' (1967) study showed that mayfly (Ephemeroptera), caddisfly (Trichoptera), true aquatic fly larvae (Diptera), and several species of snails (Gastropoda) were the most numerous aquatic organisms present in the river. The Graves (1967) study also demonstrated a progressive decrease in organism diversity and abundance as sampling approached downstream stations near Bloomfield and Farmington, New Mexico. This condition is a result of the river becoming warmer, more turbid, and increasingly silt laden as it moves downstream. Sublette (1977) reports similar findings in the Animas, La Plata, and San Juan Rivers during recent aquatic studies.

During the summer of 1966, the Technical Advisory and Investigations Branch of the Federal Water Pollution Control Administration, in conjunction with the Colorado River Basin Storage Project, conducted a biological stream survey of the San Juan River. Their findings were as follows:

> "The San Juan River was characterized as an 'unpolluted' stream up to 130 miles downstream from Navajo Dam. In this reach, the riffle areas supported from nine to 17 varieties of benthic life. In all samples, clean water organisms, such as stoneflies, mayflies, and caddis flies were dominant."

Additional studies were performed during 1973 near the confluence of the Chaco and San Juan Rivers, and 15 different macroinvertebrates were found (Westinghouse, 1975). It also was determined that the species diversity reflected a healthy benthic population.

Table 8. Aquatic invertebrates collected from the San Juan, Animas and La Plata Rivers, northwestern New Mexico[1/]

ORDER	FAMILY	COMMON NAME
Ephemeroptera	Ephemerelidae Baetidae Heptogeniidae	Mayflies
Odonata	Gomphidae Aestinidae Coenagionidae	Dragonflies
Plecoptera	Perlodidae	Stoneflies
Hemiptera	Valiidae Corixidae Naucoridae Notonectidae Gerridae	True aquatic bugs
Coleoptera	Gyrinidae Dytisicidae Hydrophilidae	Aquatic beetles
Trichoptera	Hydrophilidae Brochycentridae Hydrophilidae	Caddis flies
Diptera	Tendipedidae Simulidae Empididae Rhagionidae Ceratopoinidae Chironomidae	True aquatic flies

1/ Data obtained from studies carried out by Graves, 1967 and Sublette, 1977.

Table 8. (continued)

ORDER	FAMILY	COMMON NAME
Thysanoptera		Thrips
Gastropoda	Lymnaeidae Physidae Planorbidae Ancylidae	Snails
Annelid	Hirundinea	Aquatic worms
Amphipoda		Scuds and sideswimmers
Decapoda		Crayfish

SECTION 9 - ENDANGERED AND THREATENED SPECIES

Within the inventory area, there are 11 species of animals and four species of plants which are either listed or proposed for listing on the United States list of endangered and threatened species or the State of New Mexico list of endangered species.

The status of the species discussed in this section is based on United States List "Endangered and Threatened Wildlife and Plants" as published in the Federal Register dated October 27, 1976 and the New Mexico State Game Commission's Regulation No. 563 "Endangered Species and Subspecies of New Mexico" as adopted on January 24, 1975 and as amended March 7, 1975, December 5, 1975, and May 21, 1976.

Federal law (Endangered Species Act of 1973 - P.L. 93-205) established two categories of endangerment (a) those species in danger of extinction throughout all or a significant portion of their range, i.e., Endangered Species; and (b) those species which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range, i.e., Threatened Species.

The New Mexico list includes two groups: Group 1 - Species and subspecies whose prospects of survival or recruitment in New Mexico are in jeopardy, and Group 2 - Species and subspecies whose prospects of survival or recruitment within New Mexico are likely to be in jeopardy within the foreseeable future. The status of species listed in Group 1 are comparable to the Federal endangered category and those in Group 2 are comparable to those Federally listed as threatened.

The following is a description of species which are known to occur or are likely to occur in the inventory area, which are listed or proposed for listing as endangered or threatened species. Where data were available, information on their current status, habitat requirements and other relevent information is included. Table 9 lists confirmed sightings, specimens collected, source of information, and pertinent remarks for all species listed.

Mammals

Black-footed ferret- (*Mustela nigripes*). The black-footed ferret is the only mammal classified as endangered on both the Federal and State (Group 1) lists that could occur within the inventory area.

Confirmed sightings of black-footed ferrets were recorded near Blanding, Utah and El Morro, New Mexico in 1937 and again near Monticello, Utah in 1954 (Jack Woody, personal communication, 1976).

There have been no recent confirmed sightings of the ferret in northwestern New Mexico; however, since they are nocturnal and are seldom observed even where they are known to exist, their presence in the area cannot be discounted. As an example of the ferret's secretive behavior, a 24 day surveillance of a 35 acre prairie dog town in Mellete County, South Dakota, known to be inhabited by an adult ferret yielded only two observations of the individual.

Findley, et al., 1975, feels that if black-footed ferrets still inhabit New Mexico, the species will most likely be found in the northwestern section of the state. In New Mexico, the ferret occupies grassland habitat in association with Gunnison's prairie dogs (Findley et al., 1975). Black-footed ferrets are highly dependent on prairie dog colonies for food and cover. Recent data indicates that prairie dogs sometimes constitute up to 90% of the ferret's diet.

Mink - (*Mustela vison energumenos*). The mink is listed in Group 2 of the New Mexico state list. It has been found in association with permanent water in the San Juan-Animas drainages. Findley, et al., 1975, cites the mink as being specifically collected near Farmington and La Plata, New Mexico.

Because the mink is a valuable fur-bearer, it is speculated that intensive trapping to the point of overharvest may be the reason for the population decline in the State.

Birds

American Peregrine Falcon - (*Falco peregrinus anatum*). The peregrine is listed as endangered on the Federal list and in Group 1 of the New Mexico list.

Hubbard (1970) cites the species as being a year-round resident and breeder in the San Juan Valley. Recent confirmed sightings of the falcon in the San Juan and Chaco regions indicate the apparent suitability of the area to sustain a resident population.

When hunting the peregrine falcon prefers brush and grass habitat near permanent water (U.S.D.A. Forest Service, 1975). Cliffs with inaccessible crevices are preferred for perching and nesting. The falcon feeds primarily on passerine birds and waterfowl when available, although it will also take rodents and other small animals on occasion. The decline of the species has been attributed primarily to the use of chlorinated hydrocarbon pesticides which are ingested by many of the prey species which falcons routinely feed on. Over time, pesticide levels become cumulative and persistent in the adult female falcon. As pesticide levels increase, the bird's reproductive

system is impaired resulting in egg shell thinning and concomitant largescale mortalities on the nest. The weakened shells break under the weight of the nesting adult. However, since such pesticides have recently been banned and/or their use extremely restricted, there appears to be some indication that nesting success may be improving.

Southern bald eagle - (*Haliaeetus leucocephalus leucocephalus*). The southern bald eagle is listed as endangered on the Federal list and in Group 1 of the New Mexico list.

Hubbard (1970) indicates that southern bald eagles winter in San Juan County, and have been sighted during mid-summer near Navajo Lake. There are no known southern bald eagle nests within the inventory area.

A breeding pair requires between 30-110 acres of undisturbed nesting territory (U.S.D.A. Forest Service, 1975). The area must include large, preferrably live trees, or high, rocky cliffs within one-half mile of permanent water which sustains a fish population. Fish are the principal food source of the bald eagle, although they will also eat carrion, when available.

Extensive use of pesticides (egg shell thinning) and indiscriminate hunting are believed to be the two major factors in the decline of the species.

Mississippi kite - (*Ictinia mississippiensis*). The Mississippi kite is not presently considered Federally endangered or threatened but is listed in Group 2 of the New Mexico list. Schmitt (1976) sighted the Mississippi kite near Kirtland, New Mexico (June 2, 1972) in riparian woodland-shrubland. Unpublished records from the New Mexico Department of Game and Fish indicate that the species appears to be a "vagrant in the San Juan Valley," although a westward extension of its range has been observed during recent years.

Red-headed woodpecker - (*Melanerpes erythrocephalus caurinus*). The red-headed woodpecker is not listed as Federally endangered or threatened but is listed in Group 2 of the New Mexico list. The species has been recorded as a possible breeder near Blanco, New Mexico (Schmitt, 1976). Their habitat requirements appear to be restricted to low elevation riparian woodlands. It is believed that habitat destruction and possibly competition with starlings have been significant factors in the decline of the species in New Mexico.

Osprey - (*Pandion haliaetus*). The osprey is listed in Group 2 of the New Mexico list only.

Since fresh fish are the principal diet of the osprey, it is not surprising that they are usually observed near permanent water that provides a good food supply. Schmitt (1976) reported sightings near Blanco, New Mexico and Navajo Dam during the months of June and July, 1972. Sightings were also recorded at Chuska and Morgan Lakes in 1974 (Sanchez, personal communication, 1976). While not in the inventory area these two lakes are close enough to be influenced by activities on the area, particularly if such activities would adversely affect further use by ospreys.

The decline of the species during recent years has been attributed to habitat destruction and water pollution (U.S.D.A. Forest Service, 1975).

Fish

Colorado River squawfish - (*Ptychocheilus lucius*). The Colorado River squawfish is the only fish occurring in the area which is listed as endangered on both the Federal and State lists. Koster (personal communication, 1977) reports that the squawfish was present in the San Juan River prior to closure of Navajo Reservoir. Several squawfish were collected during the 1962 preimpoundment fishery investigation (Olson, 1962). The most recent record of a squawfish taken from the San Juan River was reported creeled by a fisherman near Bloomfield, New Mexico during mid-summer, 1966 (Olson, 1976). Squawfish have also been reported from the Animas River at Durango, Colorado.

Colorado River squawfish are said to need swift, turbid, warm waters and are unable to reproduce in reservoirs or cold tailwaters such as are found below high dams. The limited distribution and abundance of the squawfish is due, in part, to man's modification of the aquatic environment such as construction of reservoirs.

Humpback (Razorback) sucker - (*Xyrauchen texanus*). The status of the humpback sucker has been recently investigated and the listing process (threatened) has been initiated by the U.S. Fish and Wildlife Service.

Although the species has never been collected in the San Juan and Animas River drainages of New Mexico, it is likely that they occur in any of the lesser tributary streams of the upper Colorado River system. Historically, the species were indigenous to the main stream of all large tributaries of the Colorado and Green Rivers, above and below the Grand Canyon (Holden and Stalnaker, 1973).

The humpback sucker appears to prefer backwaters of big rivers or impounded waters (U.S.D.A. Forest Service, 1975). As with the

squawfish, construction of dams on the Colorado River and its major tributaries (San Juan River) has gradually reduced the habitat of these native "big river" fishes.

Bonytail chub - (Gila elegans). The status of the bonytail chub is similar to that of the humpback sucker. The bonytail chub is a rare native "big river" fish and the listing process (endangered) has been initiated by the U.S. Fish and Wildlife Service.

The bonytail chub has never been reported to occur in the San Juan River drainage in New Mexico. It was historically found in the main channels of the Colorado and Green Rivers and their major tributaries from Wyoming to Mexico. It is therefore conceivable that the bonytail chub may inhabit the San Juan River. The juvenile and sub-adult fish resemble the roundtail chub in appearance and are often difficult to distinguish. Alteration of habitat is thought to be a major cause of decline of the species.

Roundtail chub - (Gila robusta robusta). The roundtail chub is listed in Group 2 of the New Mexico list. It is found throughout the San Juan drainage, but at a low population level.

It has been collected throughout the San Juan River drainage in northwestern New Mexico. Roundtail chubs were especially abundant before and shortly after the impoundment of Navajo Reservoir (Olson, 1962, 1965). It is suggested that inter-specific competition with rainbow trout for food and predation by larger fish, such as largemouth bass, smallmouth bass, and northern pike, has resulted in reducing numbers of this native fish.

Plants

Three plant species occur on the inventory area which have been proposed for Federal listing as endangered species: Sclerocactus mesa-verdae, Pediocactus knowltonii, and Erigeron rhizomatus. One additional species (Sclerocactus whipplei heilii), occurs on the area, which although not presently considered for listing, is an extremely rare variety found only in northern San Juan County, New Mexico.

Sclerocactus mesa-verdae - The ranges of this cactus include northwest San Juan County, New Mexico and southwest Montezuma County, Colorado. Although specimens have been collected from other areas the present boundaries of the known distribution of the species are: Cortez, Colorado and the Mesa Verde cliffs on the north, southward to areas just south of Shiprock, New Mexico, eastward to areas near a natural landmark known as "the Hogback."

Typically it occupies extremely dry, exposed hillsides usually with clay soils. A small, healthy population has been located about 11 miles north of Shiprock along Highway 666. However, several populations have disappeared from areas on which they are known to have occurred. Authorities knowledgeable on the subject indicate these populations were removed by collectors for commercial sale purposes.

Pediocactus knowltonii - Recorded collections of this species are only from an area near the Colorado-New Mexico border along the Los Pinos River in San Juan County, New Mexico, from one to several miles south of La Boca. The species occupies pinon-juniper habitat overlooking the Los Pinos River. As with S. mesa verdae, it is believed that most populations were decimated by collectors and very few plants may exist in the wild.

Erigeron rhizomatus - The species has been recorded from a site located about one mile south of Fort Wingate in McKinley County and a second population was discovered about four miles east of the first in 1976. Typically it is found in Chinle clay soils in association with pinon-juniper habitat. Both populations should still exist in the area. According to available information there are no records of its existence in the inventory area.

Sclerocactus whipplei heilii - This small cactus has been recognized as an extremely rare variety found only in northern San Juan County, New Mexico. It is not as yet considered threatened or endangered because of its very recent identification as a new variety. It typically grows on rocky soils at about 7,000 feet elevation. Since only a few hundred plants of this variety are known to exist (Castetter, et al, 1976), there is great concern that over-zealous collection of this attractive cactus could result in its extirpation.

Table 9 - Endangered and threatened plants and aminals known to occur or may occur within the inventory area, New Mexico

TYPE OF OBSERVATION	LOCATION	DATE	COLLECTOR	SOURCE	COMMENTS
		BLACK-FOOTED FERRET (*Mustela nigripes*)			
Visual	Near old Fort Wingate, McKinley Co., NM	1916,1917	Joseph Crick	Bailey (1971)	Crick reports that the ferrets are frequently seen in the area.
Specimen Collected (USNM)	Near San Mateo, 10 miles NE of Mt. Taylor, McKinley Co., NM	1918	J.S. Ligon	Bailey (1971)	Specimen re-examined recently, Findley, et al. (1975)
Specimen Collected (USNM)	2 miles N of Bluewater, McKinley Co., NM	Oct 15, 1918	M.E. Musgrave	Bailey (1971)	Specimen re-examined recently, Findley, et al. (1975)
Specimen Collected	Near Mexican Springs, McKinley Co., NM	1940	----------	Halloran (1964)	Specimen examined by William E. Fair.

Table 9 (Continued)

TYPE OF OBSERVATION	LOCATION	DATE	COLLECTOR	SOURCE	COMMENTS
		MINK (*Mustela vison energumenos*)			
Specimen Collected (AMNH)	T31N,R13W, Sec. 3, La Plata, San Juan Co., NM	----------	----------	Findley, et al. (1975)	----------
Specimen Collected (USNM)	T29N, R13W, Farmington, San Juan Co., NM	---------	----------	Findley, et al. (1975)	----------
Visual	T29N,R15W, Sec. 10&14, San Juan Co., NM	Around 1900	Birdseye & Rowley	Bailey (1971)	Frequently seen along the Animas and San Juan Rivers, and around Fruitland, NM

Table 9 (continued)

TYPE OF OBSERVATION	LOCATION	DATE	COLLECTOR	SOURCE	COMMENTS
		PEREGRINE FALCON (Falco peregrinus)			
Visual	Near Navajo Damsite, San Juan Co., NM	July 21, 1960	White & Behle	White, et al. (1961)	----------
Specimen Collected (MSWB #3064)	T30N, R7W, Sec. 18, San Juan Co., NM	Summer 1966	N. Segal	NM State Heritage Program (1976)	----------
Visual	Navajo Damsite, San Juan Co., NM	June 22, 1967	A.P. Nelson	Schmitt (1976)	2 birds sighted
Visual	Sandstone cliff near Archuleta, San Juan Co., NM	June 29, 1972	Greg Schmitt	Schmitt (1976)	This bird was classified as a breeder by Hubbard, 1970.
Visual	T27N, R15W, Sec. 33, San Juan Co., NM	December 1972	Al Rodney	Bird, personal communication (Jan 3, 1977)	2 birds sighted in December, 1972. May be same bird.
Visual	T26N, R14W, Sec. 30, San Juan Co., NM	September 1973	Al Rodney	Bird, personal communication (Jan 3, 1977)	----------
Visual	San Juan Co., NM	February 1977	C. Sanchez, Jr. & Art Kinsky		1 bird sighted on rock ledge and observed in flight.

Table 9 (continued)

TYPE OF OBSERVATION	LOCATION	DATE	COLLECTOR	SOURCE	COMMENTS
		BALD EAGLE (*Haliaeetus leucocephalus*)			
Visual	Navajo Damsite San Juan Co., NM	July 21, 1960	White & Behle	White, et al. (1961)	
Visual	T29N,R15-16W, San Juan Co., NM	Winter 1968 & Spring 1969	Alan P. Nelson	NM State Heritage Program (1976)	----------
Visual	S of Chaco Canyon Natl. Monument	November 15. 1974	C. Sanchez	Sanchez, personal communication (1976)	Field sighting during fishery investigations in NW NM - 1 bird in flight.
Visual	Animas River, San Juan Co., NM	January 5, 1976	Schmitt & Cole	Schmitt, personal communication (1976)	Field sightings during survey conducted for Endangered Species Program, NM State Game & Fish Dept. - 12 birds seen; 7 adults & 5 immatures.
Visual	Miller Mesa, NM State Game & Fish Dept. Refuge, Rio Arriba Co., NM	January 7, 1976	G. Schmitt	Schmitt, personal communication (1976)	Field sightings during survey conducted for Endangered Species Program, NM State Game & Fish Dept. - 29 birds seen; both adults & immatures.
Visual	Miller Mesa, NM State Game & Fish Dept. Refuge, Rio Arriba Co., NM	December 13, 1976	Schmitt & Sawyer	Schmitt, personal communication (1976)	Field sightings during survey conducted for Endangered Species Program, NM State Game & Fish Dept. - 6 birds seen; both adults & immatures.
Visual	Animas River, San Juan Co., NM	December 18-19, 1976	Cole, Dziadulewicz, Schmitt & Weeks		Field sighting during coal EIS survey, USFWS - 2 birds seen.

Table 9 (continued)

TYPE OF OBSERVATION	LOCATION	DATE	COLLECTOR	SOURCE	COMMENTS
MISSISSIPPI KITE (*Ictinia mississippiensis*)					
Visual	Kirtland, San Juan Co., NM	June 2, 1972	G. Schmitt	Schmitt (1976)	Casual sighting.
RED-HEADED WOODPECKER (*Melanerpes erythrocephalus caurinus*)					
Visual	Near Blanco, San Juan Co., NM	August 16, 1971; June 22 & July 6, 1972	G. Schmitt	Schmitt (1976)	Possibly same bird.
Specimen Collected (DMNH)	Near Blanco, San Juan Co., NM	July 21, 1976	G. Schmitt	Schmitt (1976)	Adult male w/brood patch, probably breeding
OSPREY (*Pandion haliaetus*)					
Visual	Navajo Dam, San Juan Co., NM	June 18, 1971	G. Schmitt	Schmitt (1976)	Casual sighting, probably only a migrant.
Visual	San Juan River at Blanco, San Juan Co., NM	July 21, 1972	G. Schmitt	Schmitt (1976)	Casual sighting, probably only a migrant.

Table 9 (continued)

TYPE OF OBSERVATION	LOCATION	DATE	COLLECTOR	SOURCE	COMMENTS
COLORADO RIVER SQUAWFISH (*Ptychocheilus lucius*)					
----------	San Juan River below Rosa, San Juan Co., NM	July & August 12, 1959	Milton Seibel	NM State Heritage Program (1976)	----------
Specimen Collected (UNM)	San Juan River between Navajo Dam & Colorado border, San Juan Co., NM	August 25, 1961	W. Koster	NM State Heritage Program (1976) and Olson, (1962)	----------
Specimen Collected (NMGF)	San Juan River near Bloomfield, San Juan Co., NM	July 1966	Harold Olson	C. Sanchez, personal communication (Jan 3, 1977)	Fish creeled by angler and confirmed by H. Olson.
BONYTAIL CHUB (*Gila elegans*)					
No confirmed records of the bonytail chub have been reported in New Mexico. However, historical range of this species includes the San Juan River and major tributary streams.					
RAZORBACK SUCKER (*Xyrauchen texanus*)					
No confirmed records of the razorback sucker have been reported in New Mexico. However, historical range of this species includes the San Juan River and major tributary streams.					

Table 9 (continued)

TYPE OF OBSERVATION	LOCATION	DATE	COLLECTOR	SOURCE	COMMENTS
ROUNDTAIL CHUB (*Gila robusta robusta*)					
Specimen Collected	San Juan River	1961-1967	H. Olson	Olson, 1962, & 1967	Specimens collected during fishery investigation sponsored by Section F, Colorado River Storage Project
Specimen Collected (NFWD)	San Juan River	1974	C. Sanchez	C. Sanchez personal communication (1976)	Specimen collected below Shiprock, NM during fishery investigation.

Table 9 (continued)

TYPE OF OBSERVATION	LOCATION	DATE	COLLECTOR	SOURCE	COMMENTS
		Erigeron rhizomatus			
Thorough Field Examination	T14N, R16W, Sec. 16, McKinley Co., NM	June 10, 1976	R.K. Gierisch and B. C. Johnston	USDA Forest Service (1976)	--------
Thorough Field Examination	T14N, R16W, Sec. 16, McKinley Co., NM	June 10, 1976	R.K. Gierisch and B. C. Johnston	USDA Forest Service (1976)	--------
Thorough Field Examination	T14N, R15W, Sec. 7 SW¼ McKinley Co., NM	August 14, 1976	F. Manthey	USDA Forest Service (1976)	-------

Table 9 (continued)

TYPE OF OBSERVATION	LOCATION	DATE	COLLECTOR	SOURCE	COMMENTS
		Pediocactus knowltonii			
Specimen Collected (POM #288, 314)	Los Pinos River near La Boca, CO. border, San Juan Co., NM	Late May, 1958	Fred Knowlton	Benson (1960)	--------
Specimen Collected (UNMH #28273)	S of La Boca, CO., San Juan Co., NM	January 26, 1961	P. Pierce	NM State Heritage Program (1976)	--------
Specimen Collected (UNMH #51056)	S of CO. border near Los Pinos River, San Juan Co., NM	1961	Reeves	NM State Heritage Program (1976)	--------
Specimen Collected (UNMH #45665)	S of La Boca, CO., San Juan Co., NM	1967	P. Pierce	NM State Heritage Program (1976)	--------
Specimen Collected (UNMH #51056)	Near Los Pinos River, San Juan Co., NM	1971	K. Heil	NM State Heritage Program (1976)	--------

Table 9 (continued)

TYPE OF OBSERVATION	LOCATION	DATE	COLLECTOR	SOURCE	COMMENTS
		Sclerocactus mesa-verdae			
Specimen Collected (POM #16158 and 16159)	W of Shiprock San Juan Co., NM	----	L. Benson	Benson (1966a)	--------
Specimen Collected (DBGA #1314)	N of Shiprock San Juan Co., NM	1953	Blakley	Benson (1966a)	--------
Specimen Collected (POM)	Near Shiprock San Juan Co., NM	Summer 1959	B. Hamilton	Benson (1966a)	--------
Specimen Collected (UNMH)	E of Shiprock San Juan Co., NM	November 1, 1963	R. Reeves	Benson (1966a)	--------
Specimen Collected (UNMH)	Near Shiprock San Juan Co., NM	May 8, 1964	R. Reeves	Benson (1966a)	--------
Specimen Collected (UNMH)	N of Shiprock San Juan Co., NM	March 10, 1965	R. Reeves & K. Heil	Benson (1966a)	2 specimens collected
Specimen Collected (UNMH)	S of Shiprock San Juan Co., NM	March 1965	K. Heil	Benson (1966a)	--------

Table 9 (continued)

TYPE OF OBSERVATION	LOCATION	DATE	COLLECTOR	SOURCE	COMMENTS
		Sclerocactus whipplei heilii			
Visual	Northern San Juan Co., NM	----	-----	Castetter, et al (1976)	Only a few hundred plants observed
Specimens Collected (UNMH #49871, 49872, 49874, 51060, 51057)	Northern San Juan Co., NM	August 7, 1971	K. Heil	Castetter, et al (1976)	These specimens determined the validity of the sub-species
Specimen Collected (UNMH)	Mt. Nebo, San Juan Co., NM	November 7, 1976	C. Sanchez & W. Bird	Sanchez, personal communication (Nov. 1976)	15 plants observed in one small area.

USNM - National Museum of Natural History
AMNH - American Museum of Natural History
MSWB - Museum of Southwestern Biology
DMNH - Delaware Museum of Natural History
UNM - University of New Mexico
NMGF - New Mexico Department of Game and Fish
POM - Pomona College
DBGA - Desert Botanical Garden of Arizona
UNMH - University of New Mexico Herbarium
USF&WS - United States Fish and Wildlife Service
BLM - Bureau of Land Management
NFWD - Navajo Fish and Wildlife Department

SECTION 10 - SENSITIVE OR KEY AREAS

San Juan, Animas, La Plata Rivers

The San Juan, Animas, and La Plata River drainages are uniquely important in water-short New Mexico. Permanent surface water, particularly riverine and associated riparian habitat, is seriously deficient in the State. Aside from the biological and aesthetic importance of these water resources, their overall economic value for municipal, industrial, agricultural, and recreational purposes is perhaps incalculable when the local and widespread economic benefits which are generated incidental to these primary purposes are considered.

The biological importance of the three-river complex is indisputable; its aquatic and riparian biota ranks among the best in the Southwest. The San Juan River is rated by some as one of the top ten trout streams in the United States.

In light of the extremely sensitive and irreplaceable nature of these resources, any energy development proposal that would adversely impact them should be discouraged. Riparian habitat in the area has already been reduced significantly; further destruction should not be permitted.

Max Lopez Spring

The spring is located along a shale outcropping on the southeastern boundary of the inventory area within Section 34, Township 19 North, Range 3 West. It has been developed primarily for livestock watering.

During dry periods the spring is one of two dependable water supplies available to wildlife for several miles around. The other water supply is Eagle Spring located about two miles to the west. Although Max Lopez Spring is valuable for this reason alone, its setting among rugged cliffs and healthy stands of pinon-juniper woodland make it doubly attractive to many species of wildlife. Several raptor species such as the prairie falcon, red-tailed hawk, kestrel, and great-horned owl have been observed perching and hunting in the immediate area. Even without these observations, such use is conspicious by the typical "whitewash" on nearby cliffs and the presence of raptor pellets or castings at the base of the cliffs.

Observations and signs indicate that the spring is also utilized by deer, rabbits, many small rodents, and numerous birds and reptiles. In view of the foregoing, any contemplated development of the area

or associated activities that would disturb or alter its value for wildlife, should not be permitted. Also, to preserve the value of the site, it is urged that, as a minimum, a buffer zone of one-quarter mile surrounding the site, be established.

Eagle Spring

Eagle Spring is located within Section 33, Township 19 North, Range 3 West about two miles west of Max Lopez Spring. The site is in a sagebrush setting close to pinon-juniper woodland and is part of the sagebrush/pinon-juniper ecotone. While not as attractive as Max Lopez Spring it is only slightly less valuable for wildlife. Its dependable water supply in an otherwise extremely arid area is its most important attribute. However, the location of the spring makes it available to members of the sagebrush community such as antelope and numerous small birds and mammals and also to species typically found in pinon-juniper woodland such as deer. As with Max Lopez Spring, development of the area or associated activities which would degrade its wildlife values, should not be permitted and a minimum quarter mile buffer zone surrounding the area should be established to preserve these values.

Key Habitats

Within the inventory area there are several habitats which may be essential to the survival and well being of several wildlife species particularly elk, deer, peregrine falcon, and black-footed ferret. Since it was not within the scope of the inventory to precisely delineate these habitats or to make recommendations concerning potential impacts on them as a result of possible energy development or future grazing management plans, the habitats are discussed only generally. Final decisions as to whether any proposed activities would adversely impact such habitats would have to be based on a case-by-case in-depth assessment of each proposal, yet keeping in mind the additive or cumulative effects of all potential future actions.

However, it is urged that such essential habitats as elk and deer winter ranges, prairie dog towns (= black-footed ferret), and habitats known to be used by peregrine falcons, be individually evaluated from the standpoint of how and to what extent a particular proposal could affect them.

The effects of coal development are expected to be substantially different than the impacts associated with grazing. Often these effects appear subtle and seemingly minor when, in fact, they are significant and, in the long term, may become major impacts; e.g.,

removal of habitats utilized by prey species may seriously influence the behavior and perhaps even the survival of predator species, particularly certain carnivores and raptors. It is therefore suggested that the Bureau of Land Management carefully evaluate the potential adverse impacts of not only individual future actions that may affect wildlife and their habitats, but also the cumulative effects of all such proposals.

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APPENDIX A
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APPENDIX A - BIBLIOGRAPHY

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APPENDIX B
TRANSECT MAPS
AND
LOCATIONS

APPENDIX B - TRANSECT MAPS AND LOCATIONS

Transect 1. Name - Torreon Wash. Location - Sandoval and McKinley Counties.
Access: West out of Cuba on New Mexico 197 for approximately 17 miles to Johnson Trading Post. Continue west on dirt road for approximately 4.5 miles to start of transect marked by road junction and gate.
USGS Quadrangle maps needed:

Start:	Johnson Trading Post (7.5 minute)
Continued:	Ojo Encino Mesa (7.5 minute)
End:	Johnson Trading Post (7.5 minute)
Approximate mileage:	19
Number of stations:	38 (2 per mile)

Transect 2. Name - Star Lake. Location - Sandoval and McKinley Counties.
Access: Proceed from the start of Transect 1 west for 2 miles to start of Transect 2 which begins 1 mile past cattle guard.
USGS Quadrangle maps needed:

Start:	Ojo Encino Mesa (7.5 minute)
Continued:	Tinian (7.5 minute)
	Ojo Encino Mesa (7.5 minute)
	Star Lake (7.5 minute)
	Pueblo Alto Trading Post (7.5 minute)
End:	Star Lake (7.5 minute)
Approximate mileage:	36
Number of stations:	36 (1 per mile)

Transect 3. Name - Chaco Canyon. Location - San Juan County.
Access: Proceed on New Mexico 44 to Blanco Trading Post; continue southwest for 9 miles on New Mexico 56 to start of transect marked by road junction.
USGS Quadrangle maps needed:

Start:	Pueblo Bonito NW (7.5 minute)
Continued:	Pueblo Bonito (7.5 minute)
End:	Sargent Ranch (7.5 minute)
Approximate mileage:	22.5
Number of stations:	45 (2 per mile)

Transect 4. Name - Bisti. Location - San Juan County.
Access: South from Farmington on New Mexico 371 for approximately 14 miles, after crossing San Juan River, turn west (SE¼ Section 25) travel approximately 15 miles to intersect with main road to Bisti Trading Post, turn south. Continue approximately 11 miles to start of transect 4 marked by sign that reads "Burnam Chapter Trading Post 15 miles."
USGS Quadrangle maps needed:

Start	Bisti Trading Post (7.5 minute)
Continued:	Alamo Mesa West (7.5 minute)
	Tanner Lake (7.5 minute)
	Pretty Rock (7.5 minute)
End:	Pueblo Bonito NW (7.5 minute)
Approximate mileage:	32
Number of stations:	32 (1 per mile)

Transect 5. Name - Vanderwagon. Location - McKinley County.
Access: South from Gallup 12 miles on New Mexico 32 to dirt road with sign that reads "Valley View Assembly of God Church." Transect starts ½ mile in from road.
USGS Quadrangle maps needed:

Start	Vanderwagon (7.5 minute)
End:	Vanderwagon Draw (7.5 minute)
Approximate mileage:	16.5
Number of stations:	33 (2 per mile)

Transect 6. Name - Gamerco. Location - McKinley County.
Access: From Gallup 5 miles west to Mentmore north across arroyo. Turn left on first dirt road after crossing bridge. Transect starts ½ mile from road.
USGS Quadrangle maps needed:

Start:	Gallup West (7.5 minute)
Continued:	Samson Lake (7.5 minute)
End:	Gallup West (7.5 minute)
Approximate mileage:	11
Number of stations:	22 (2 per mile)

Transect 7. Name - Crownpoint. Location - McKinley County.
Access: West off New Mexico 56, 16 miles north of Thoreau. Transect starts 1 mile from junction with Highway 56.
USGS Quadrangle maps needed:

Start:	Hosta Butte (7.5 minute)
Continued:	Crownpoint (7.5 minute)
	Dalton Pass (7.5 minute)
End:	Crownpoint (7.5 minute)
Approximate mileage	16
Number of stations:	32 (2 per mile)

Transect 8. Name - Hospah. Location - McKinley County.
Access: East from Crownpoint on Highway 56 to Seven Lakes, continue east on Indian Highway 9 to Whitehorse; turn south on dirt road at Whitehorse Trading Post and travel 6.5 miles to Hospah. Start of transect is east of Hospah Oil Field. Alternate access from I-40 between Grnats and Gallup. Take Prewitt exit off I-40 and follow dirt road north to Hospah. Use Quadrangles Thoreau NE, Casamero Lake, Borrego Pass, Mesa de los Toros, Orphan Annie Rock, Hospah, approximately 35 miles north of Prewitt to Hospah.
USGS Quadrangle maps needed:

Start:	Hospah (7.5 minute)
Continued:	Mesita Americana (7.5 minute)
End:	Hospah (7.5 minute)
Approximate mileage:	14.5 miles
Number of stations:	29 (2 per mile)

Transect 9. Name - Kirtland. Location - San Juan County.
Access: 2.4 miles northwest of the junction of Highway 550 and the landfill road, approximately 4 miles west of Farmington.
USGS Quadrangle maps needed:

Start:	Youngs Lake (7.5 minute)
Continued:	Purgatory Canyon (7.5 minute)
	Heifer Point (7.5 minute)
End:	Waterflow (7.5 minute)
Approximate mileage:	19 miles
Number of stations:	38 (2 per mile)

Transect 10. Name - La Plata. Location - San Juan County.
Access: 1 mile northwest of Highway 170 on County Road 56, approximately 9 miles north of Farmington.
USGS Quadrangle maps needed:

Start:	La Plata (7.5 minute)
End:	La Plata (7.5 minute)
Approximate mileage:	12
Number of stations:	24 (2 per mile)

Transect 11. Name - Flora Vista. Location - San Juan County.
Access: 0.5 miles north of Highway 173 on County Road 57, approximately 20 miles northeast of Farmington.
USGS Quadrangle maps needed:

Start:	Adobe Downs (7.5 minute)
End:	Flora Vista (7.5 minute)
Approximate mileage:	19
Number of stations:	38 (2 per mile)

Transect 12. Name - Cedar Hill. Location - San Juan County.
Access: Begin transect 1 mile east of Highway 550, approximately 1 mile south of Cedar Hill and 8 miles north of Aztec.
USGS Quadrangle maps needed:

Start:	Aztec (15 minute)
End:	Aztec (15 minute)
Approximate mileage:	25
Number of stations:	50 (2 per mile)

Transect 13. Name - Largo Canyon. Location - San Juan County.
Access: From Bloomfield east 10 miles on New Mexico 17 to Cutter Dam cutoff. Transect starts 1 mile in from junction of New Mexico 17 and dirt road.
USGS Quadrangle maps needed:

Start:	Bloomfield (15 minute)
Continued:	Gould Pass (15 minute)
	Nageezi (15 minute)
End:	Huerfano Trading Post (7.5 minute)
Approximate mileage:	41
Number of stations:	41 (1 per mile)

Transect 14. Name - Mount Taylor. Location - Valencia County.
Access: Take exit off I-40, 62 miles west of Albuquerque, take old Highway 66 east 1.4 miles to dirt road leading to the north to Lane Ranch, travel 1.75 miles to start of transect at sign "Route 400".

USGS Quadrangle maps needed:

Start:	McCartys (7.5 minute)
Continued:	Lobo Springs (7.5 minute)
	Mt. Taylor (7.5 minute)
End:	Lobo Springs (7.5 minute)
Approximate mileage:	19
Number of stations:	38 (2 per mile)

Transect 15. Name - San Mateo Mesa. Location - McKinley County.
Access: Northeast out of Milan on Highway 53 to San Mateo; take Road 192 north out of San Mateo to start of transect.

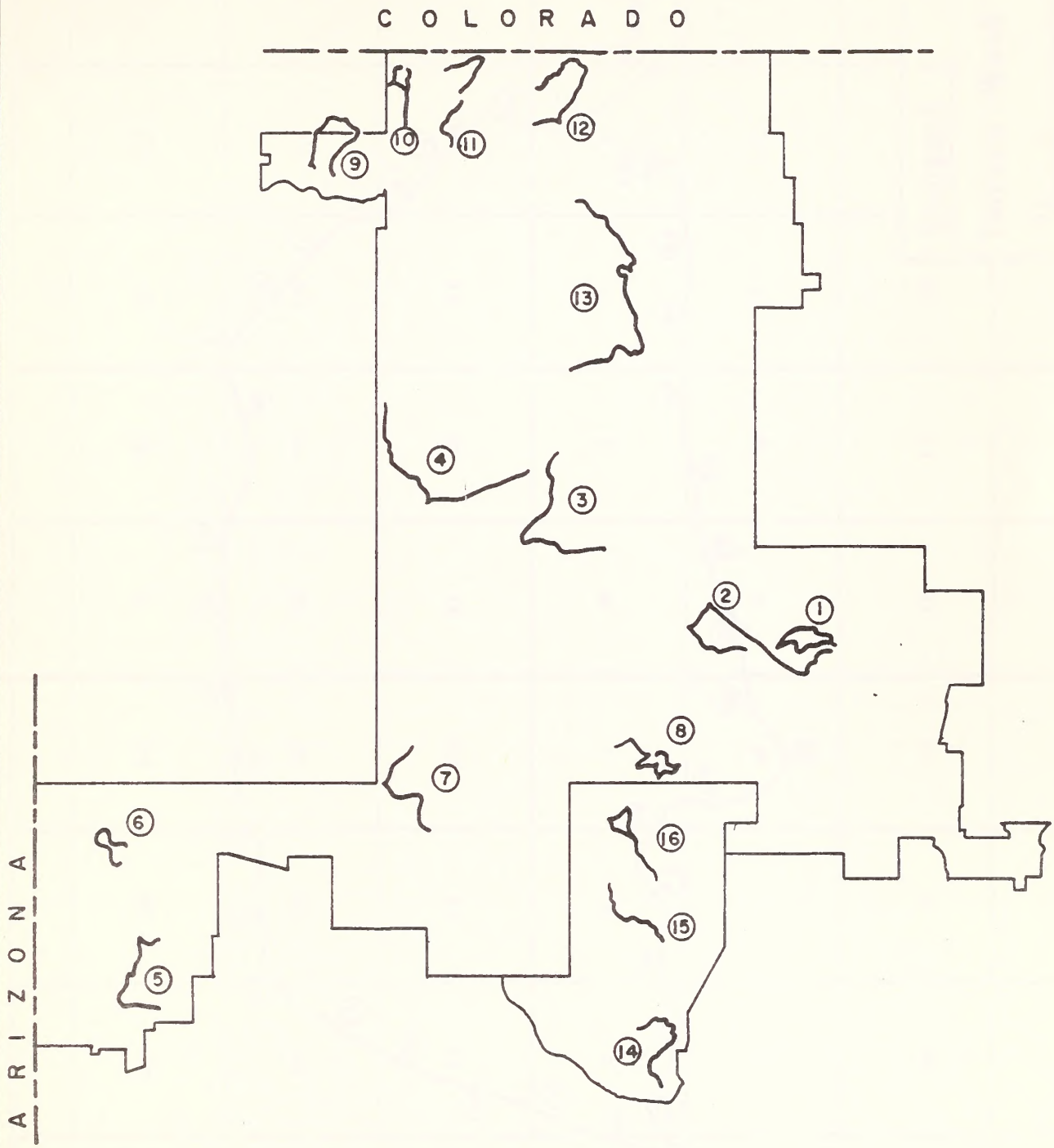
USGS Quadrangle maps needed:

Start:	San Mateo (7.5 minute)
End:	San Lucas Dam (7.5 minute)
Approximate mileage:	10
Number of stations:	20 (2 per mile)

Transect 16. Name - Piedra de la Aquila. Location - McKinley County.
Access: Highway 53 from Milan to San Mateo. Take Road 192 northwest out of San Mateo, turn northeast on Road 556, travel approximately 8.5 miles to start of transect.

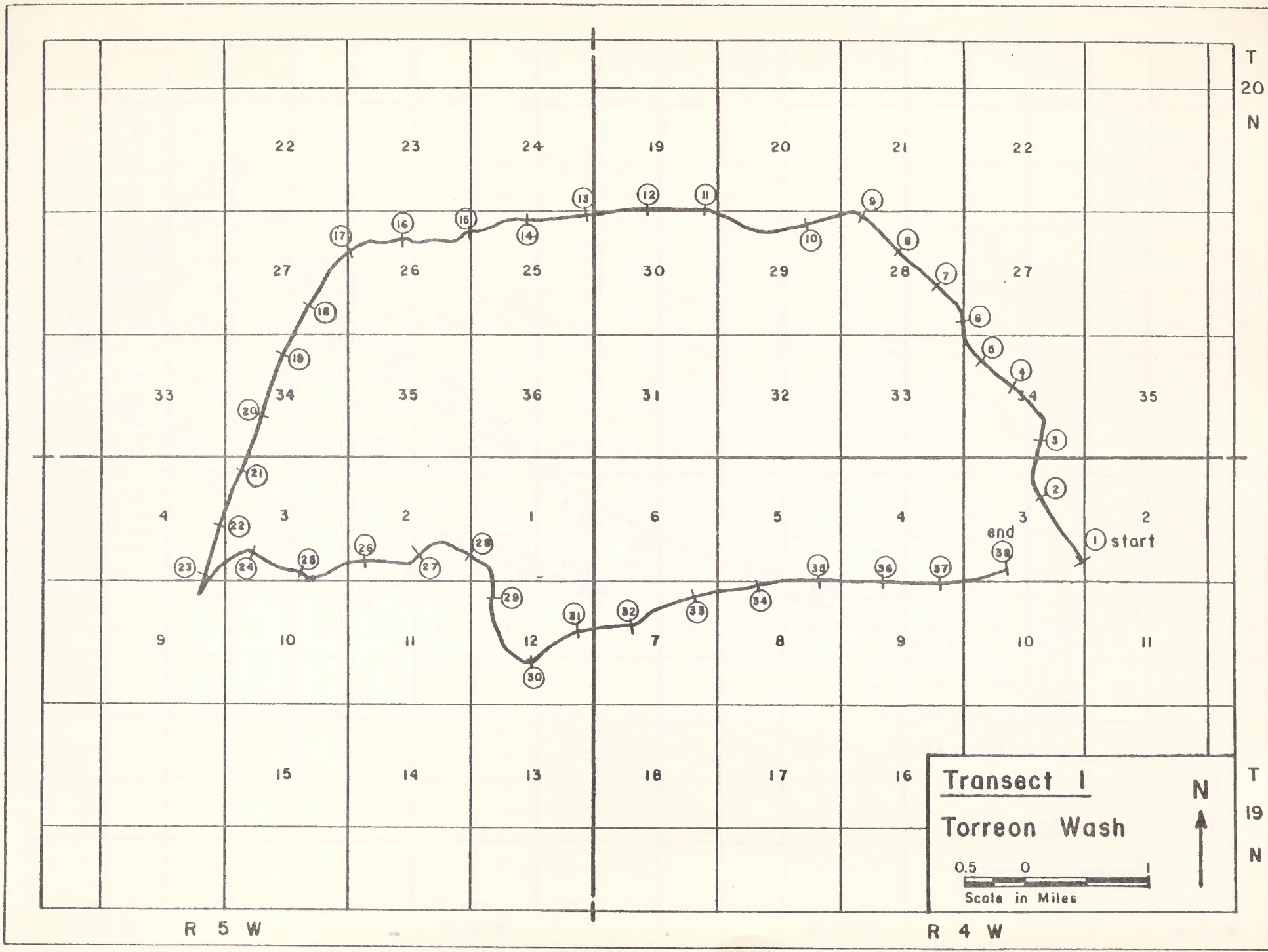
USGS Quadrangle maps needed:

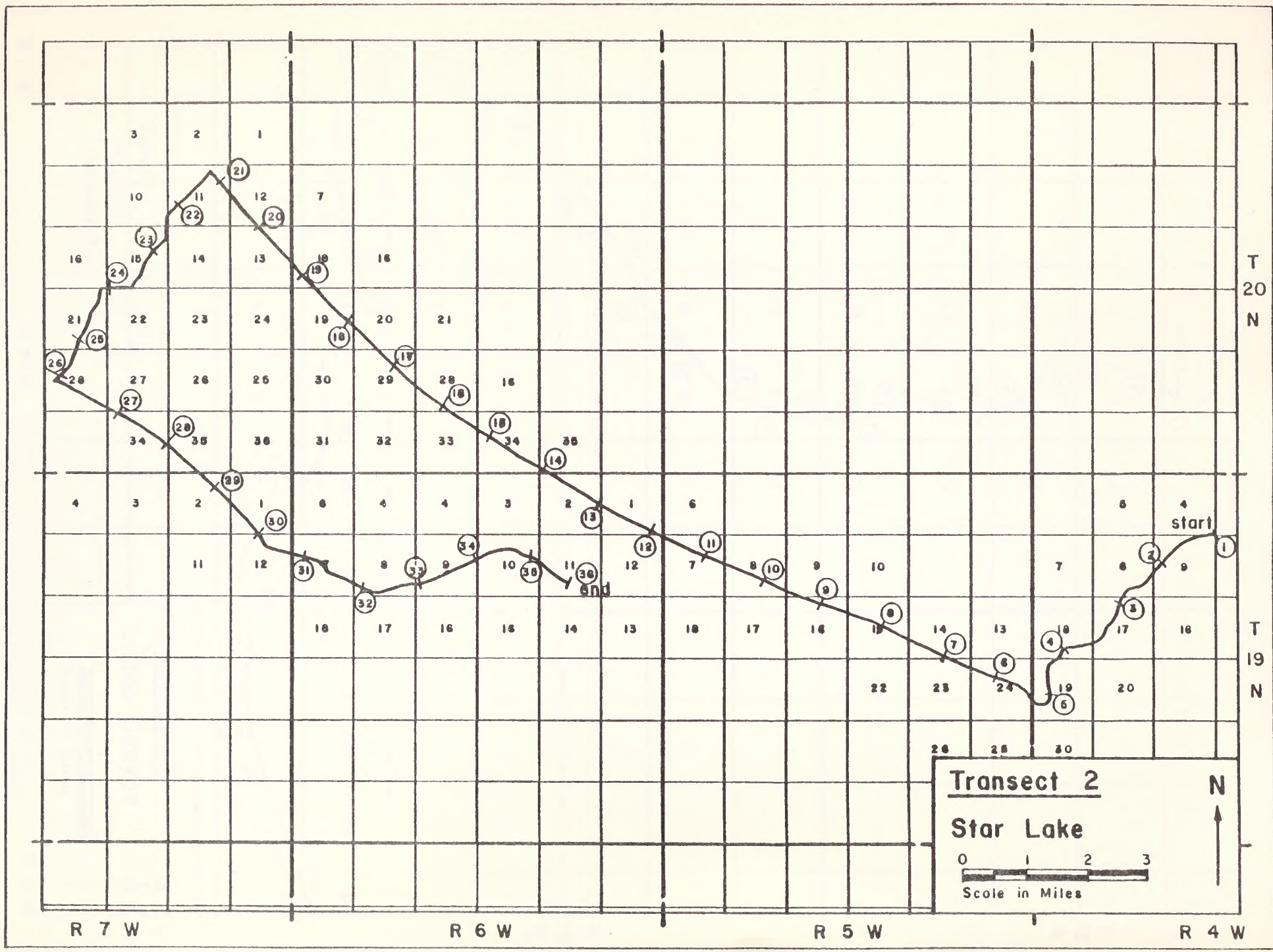
Start:	San Lucas Dam (7.5 minute)
End:	Piedra de la Aquila (7.5 minute)
Approximate mileage:	17.5
Number of stations:	35 (2 per mile)

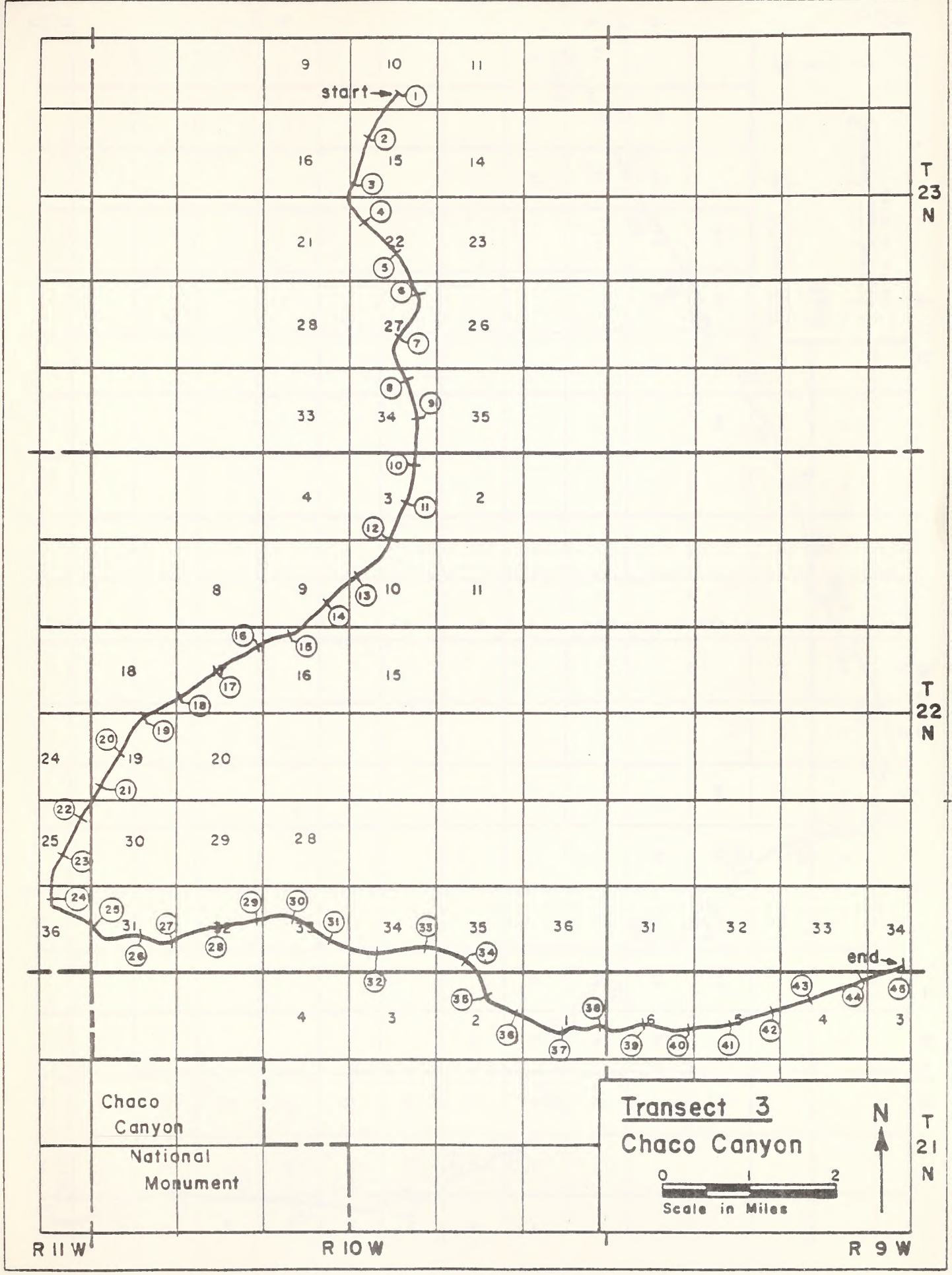


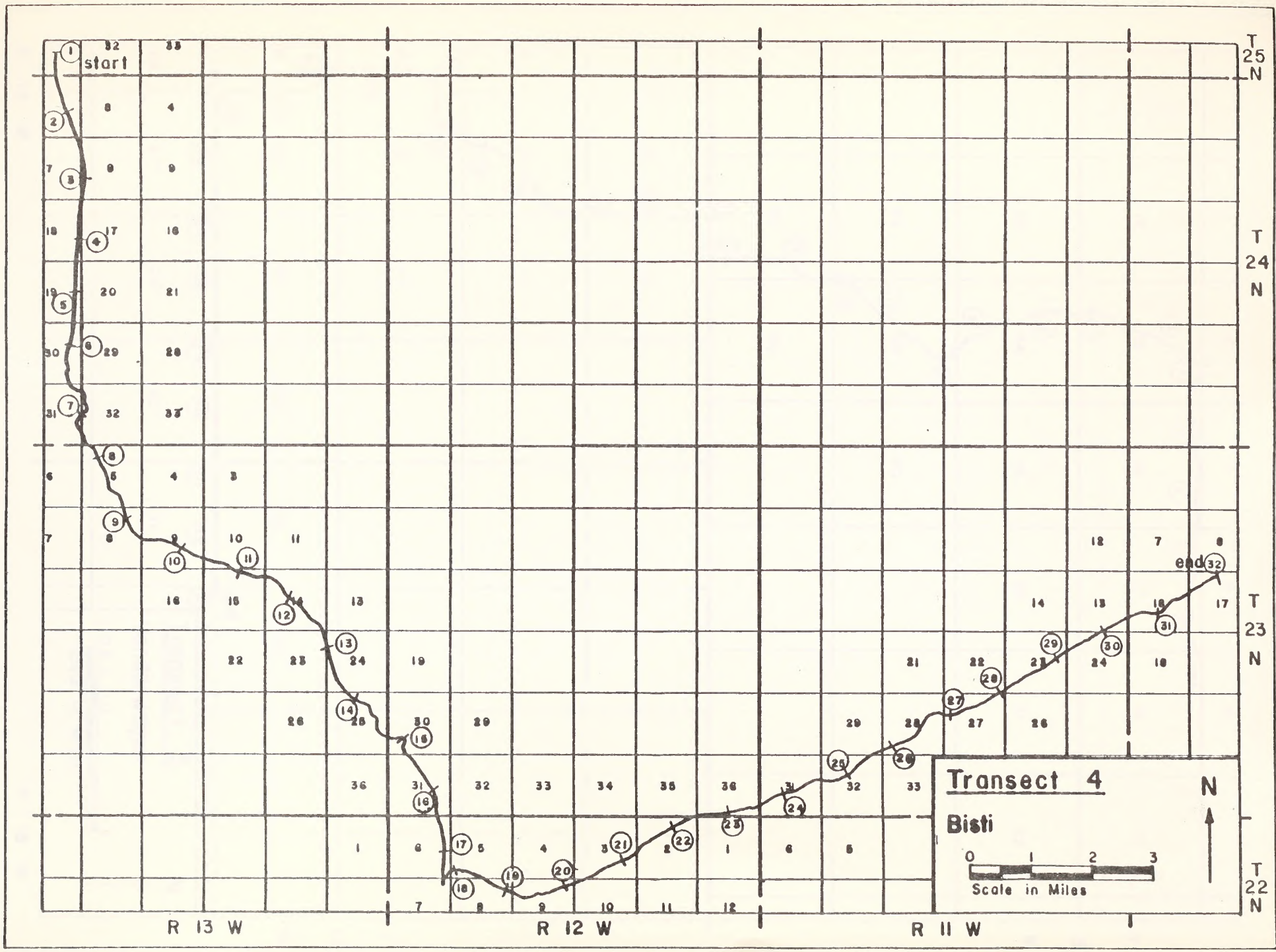
(Lease Boundaries = Approx.)

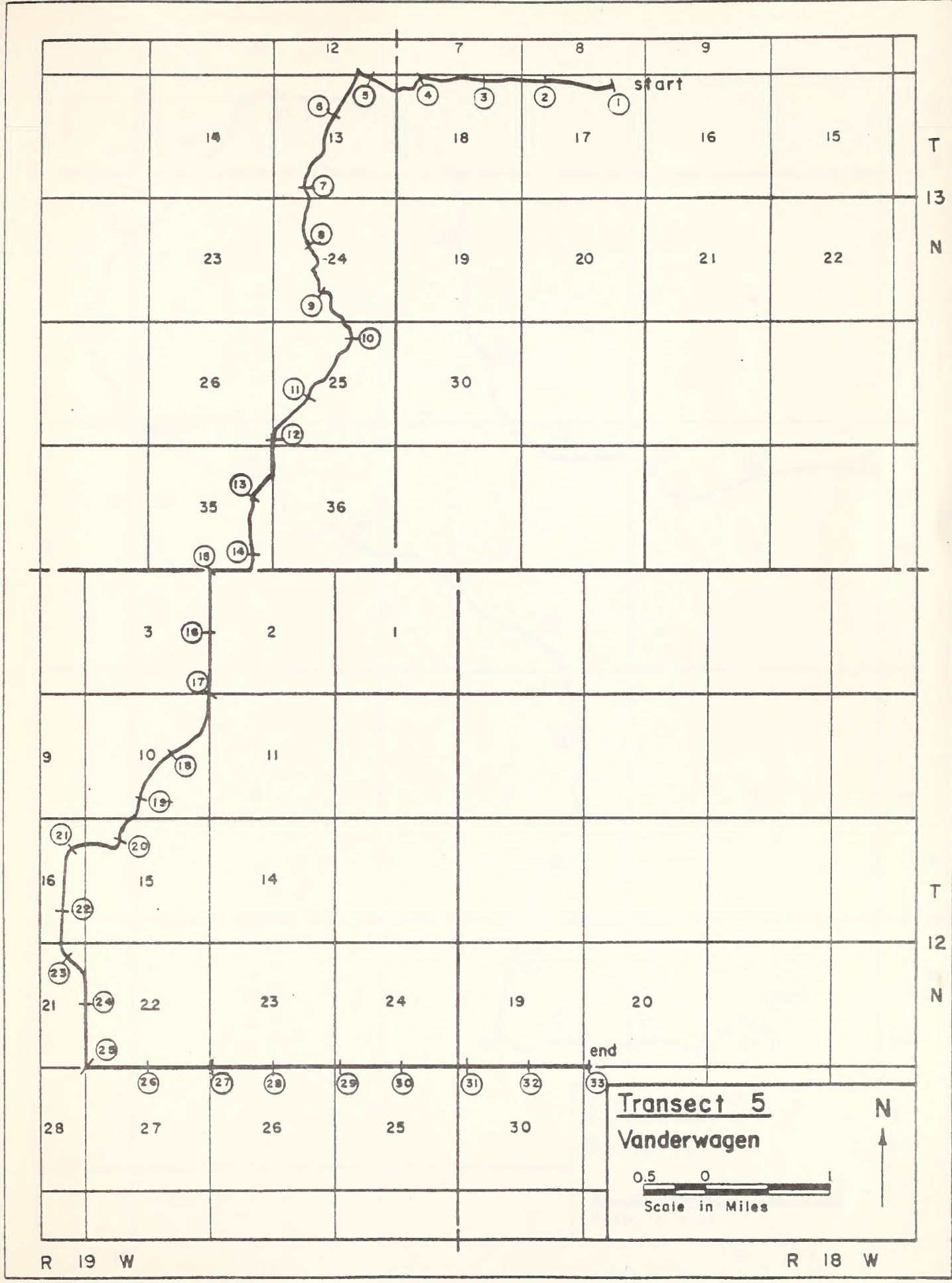
LOCATIONS OF WILDLIFE TRANSECTS 1-16

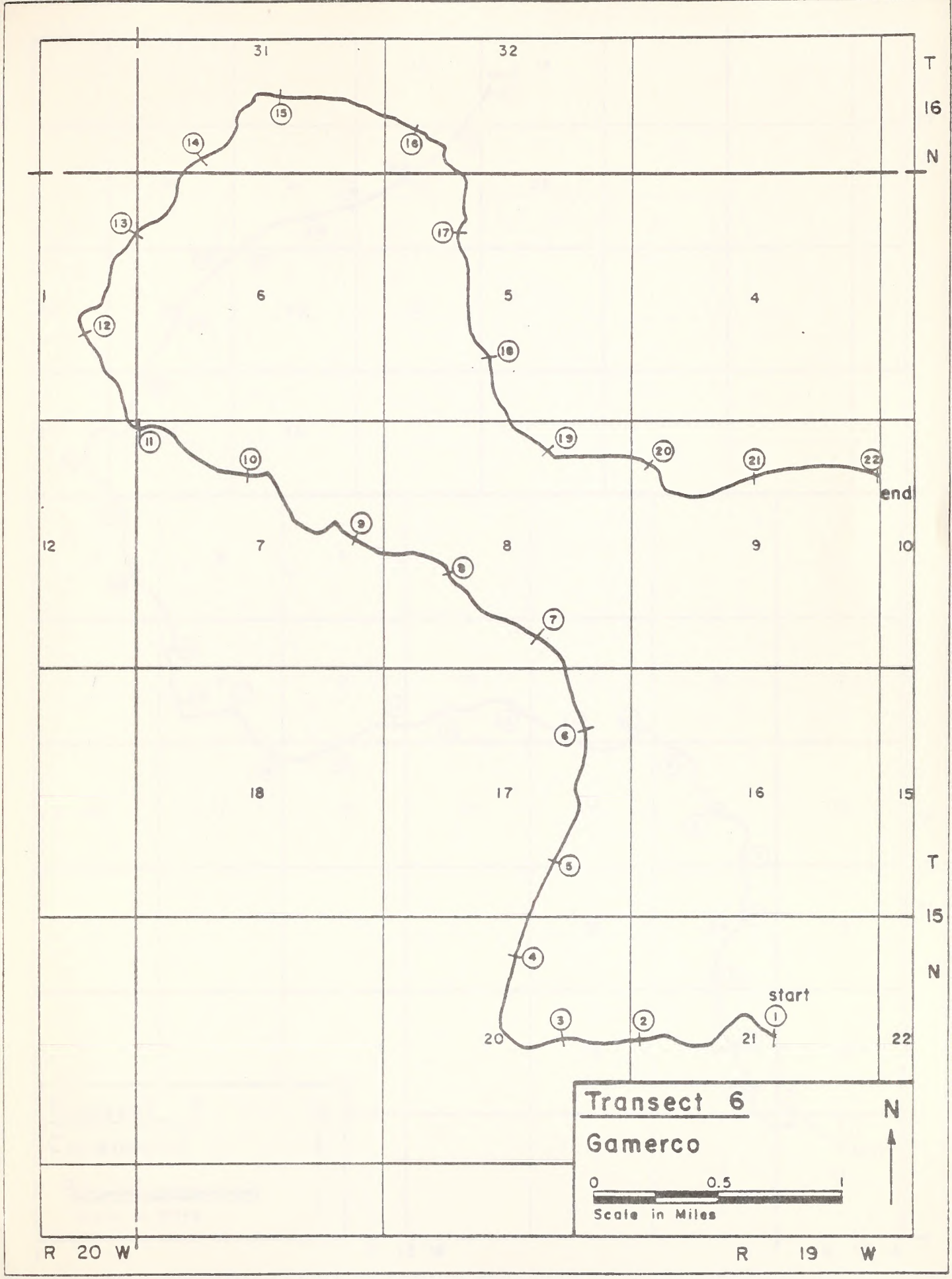

T 20 N
T 19 N
R 5 W
R 4 W
start
end
Transect I
Torreon Wash
N
0.5 0 1
Scale in Miles

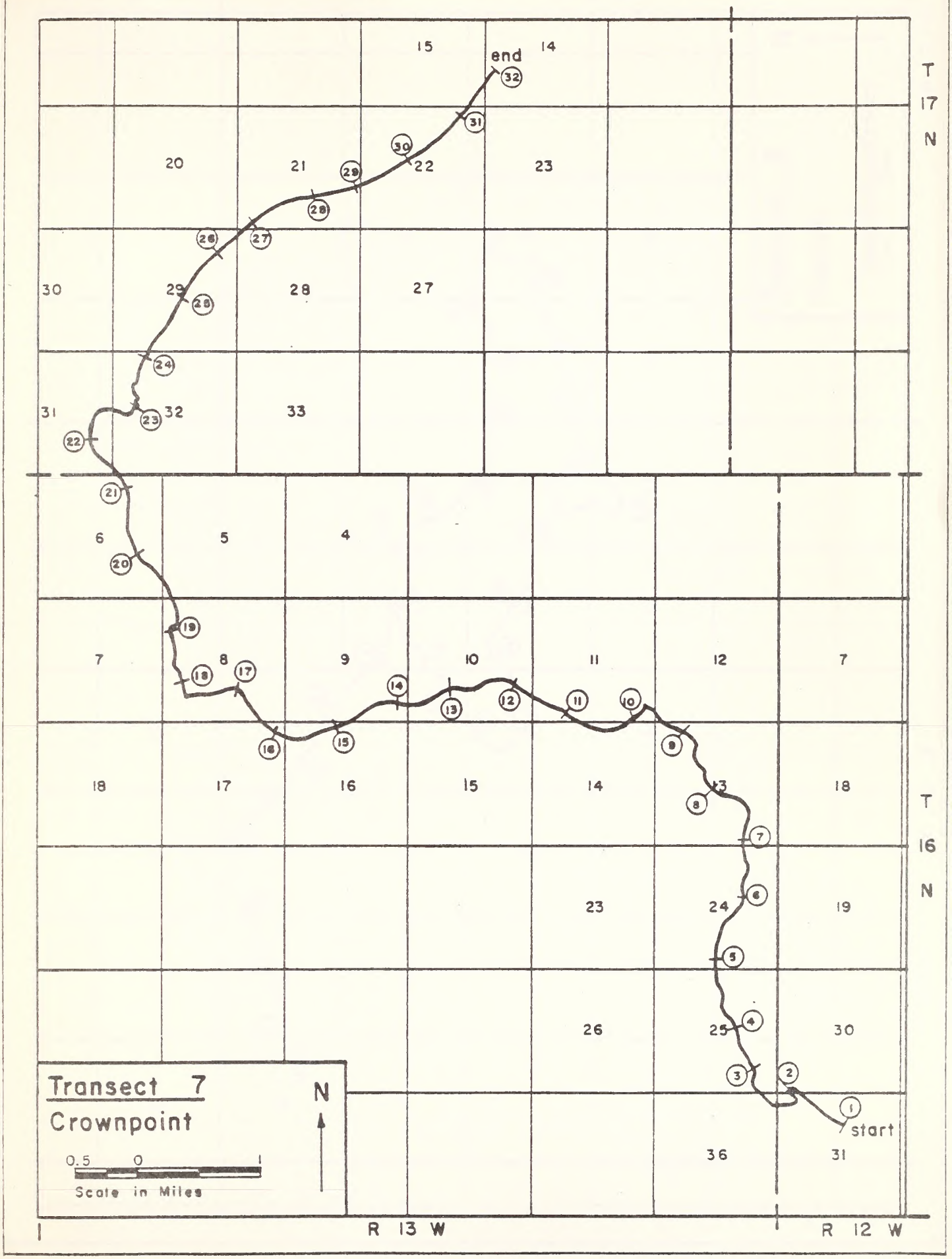

Transect 2
Star Lake
0 1 2 3
Scale in Miles
N
start
end
T 20 N
T 19 N
R 7 W
R 6 W
R 5 W
R 4 W

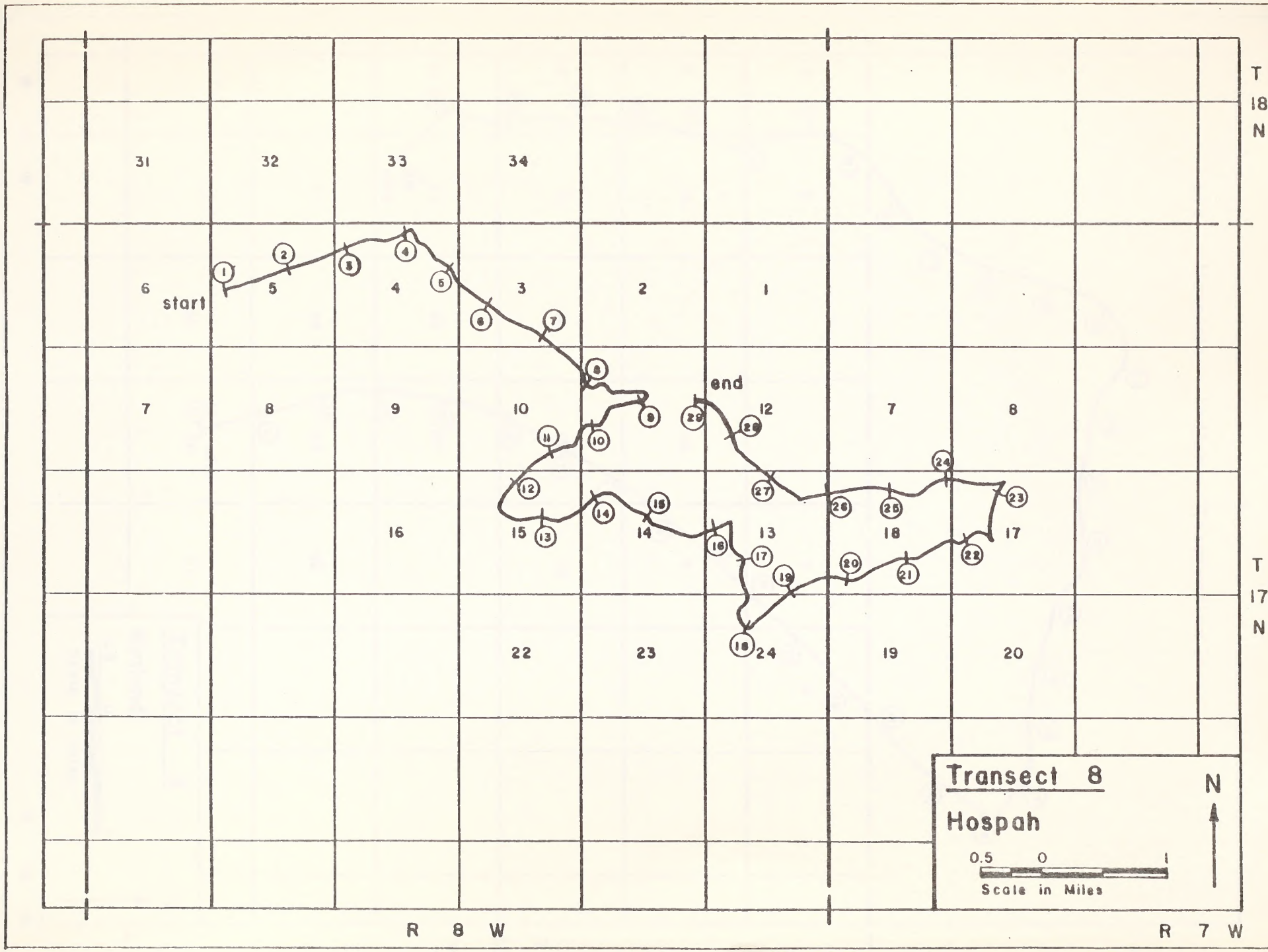

start
end
T 23 N
T 22 N
T 21 N
R 11 W
R 10 W
R 9 W
Chaco Canyon National Monument
Transect 3
Chaco Canyon
N
0 1 2
Scale in Miles

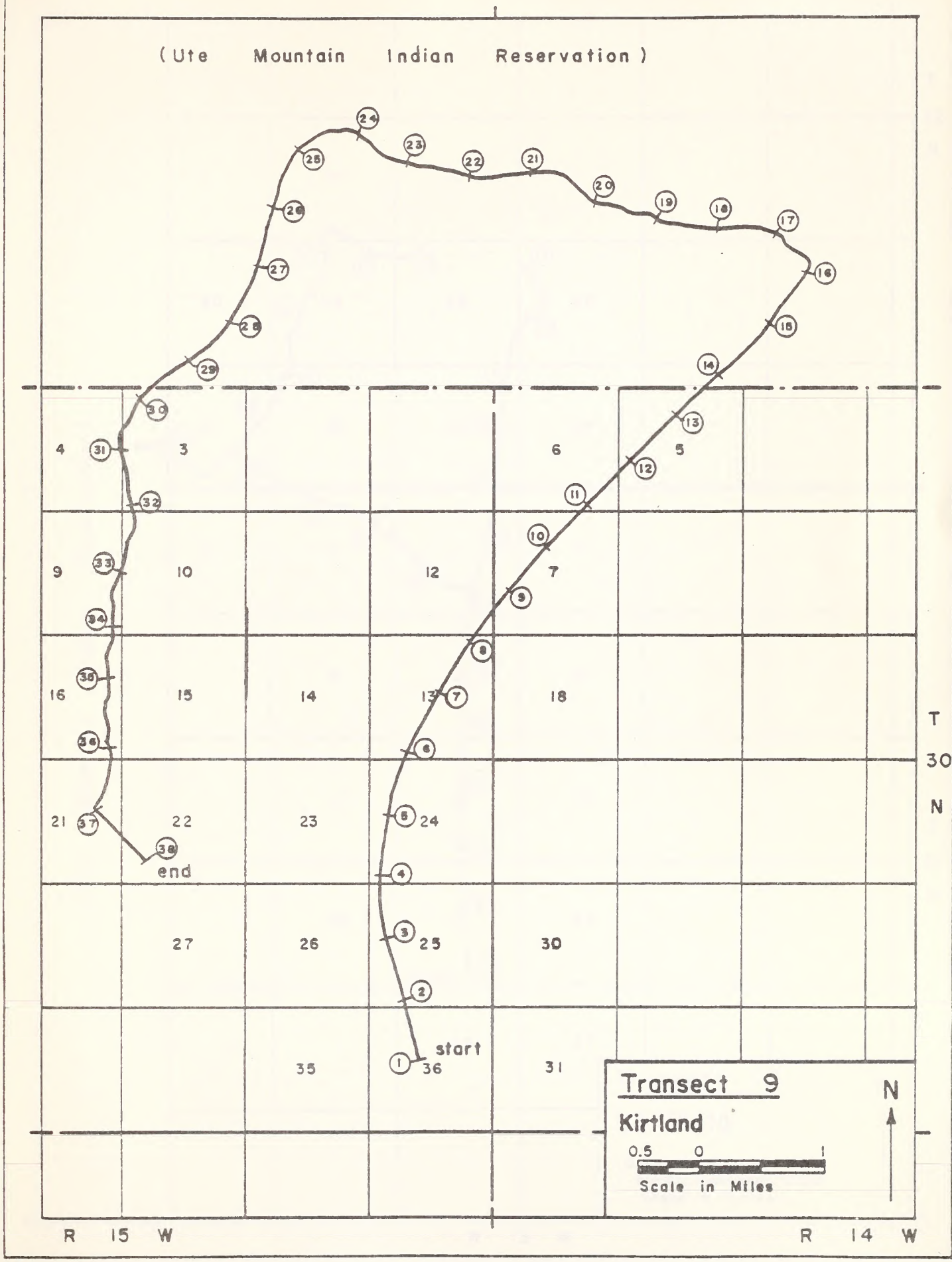

Transect 4
Bisti
N
0 1 2 3
Scale in Miles
start
end
T 25 N
T 24 N
T 23 N
T 22 N
R 13 W
R 12 W
R 11 W

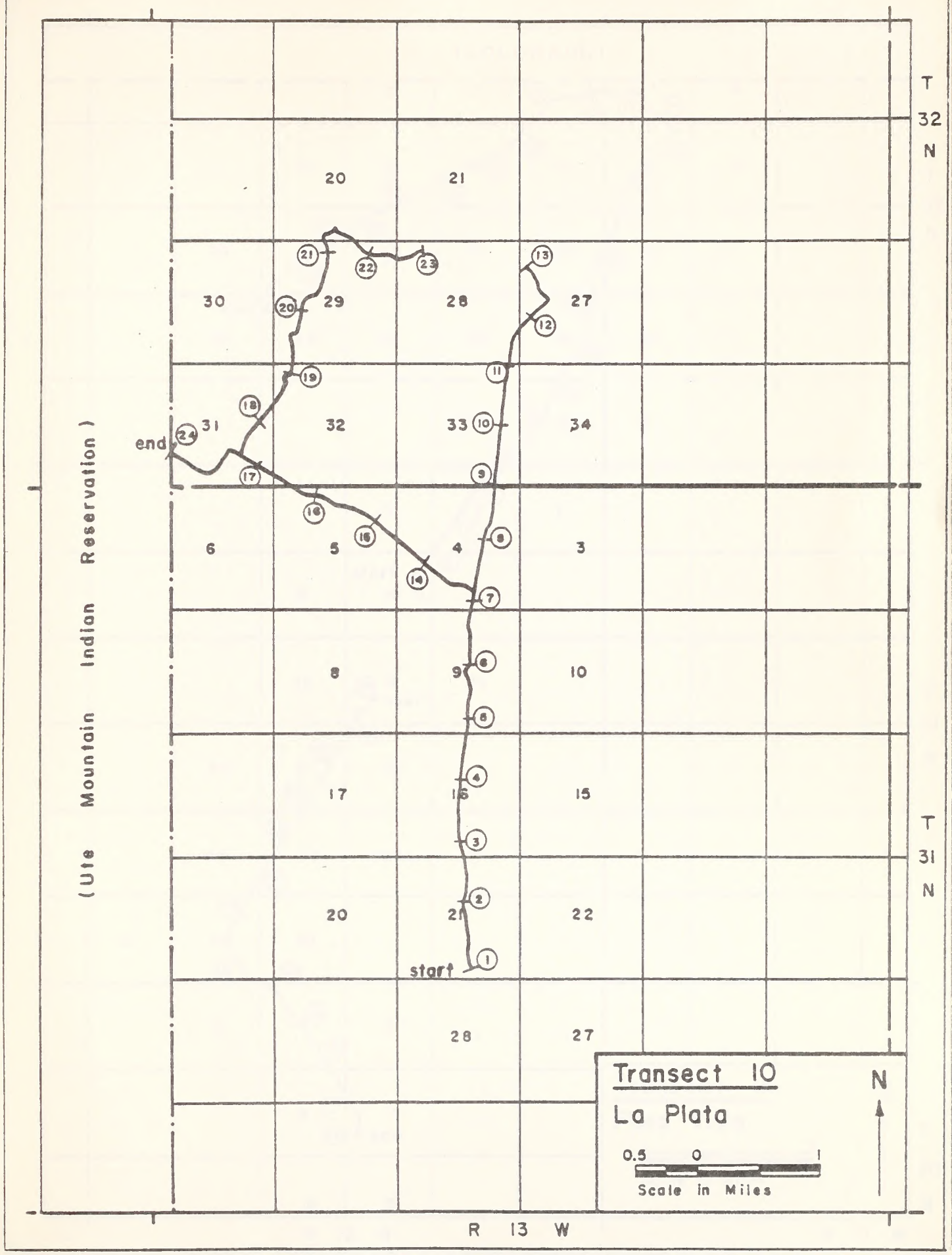

start
end
T 13 N
T 12 N
R 19 W
R 18 W
Transect 5
Vanderwagen
0.5 0 1
Scale in Miles
N


Transect 6
Gamerco
N
0
0.5
1
Scale in Miles
start
end
T 16 N
T 15 N
R 20 W
R 19 W
31
32
6
5
4
1
12
7
8
9
10
18
17
16
15
20
21
22

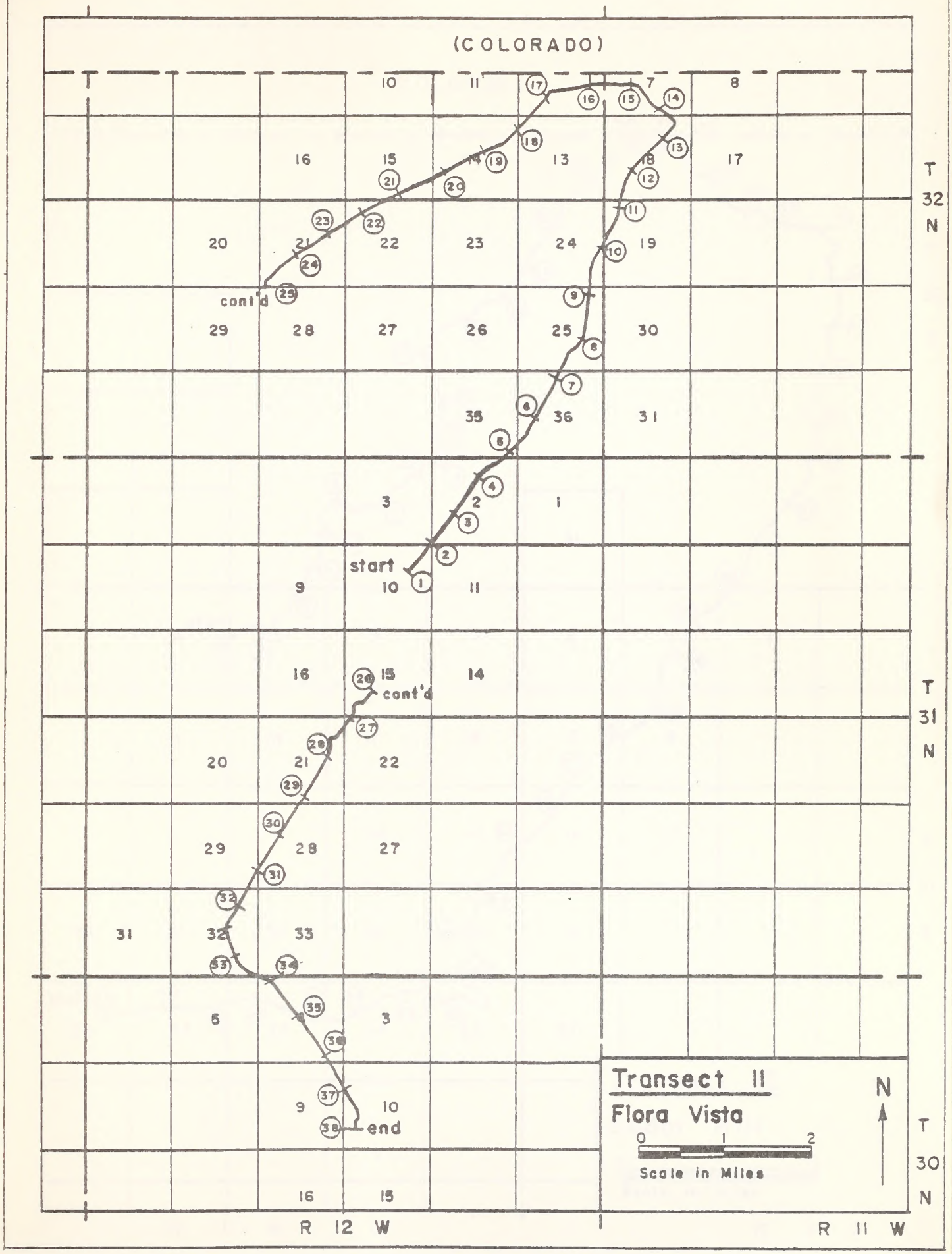

Transect 7
Crownpoint
0.5 0 1
Scale in Miles
N
start
end
T 17 N
T 16 N
R 13 W
R 12 W

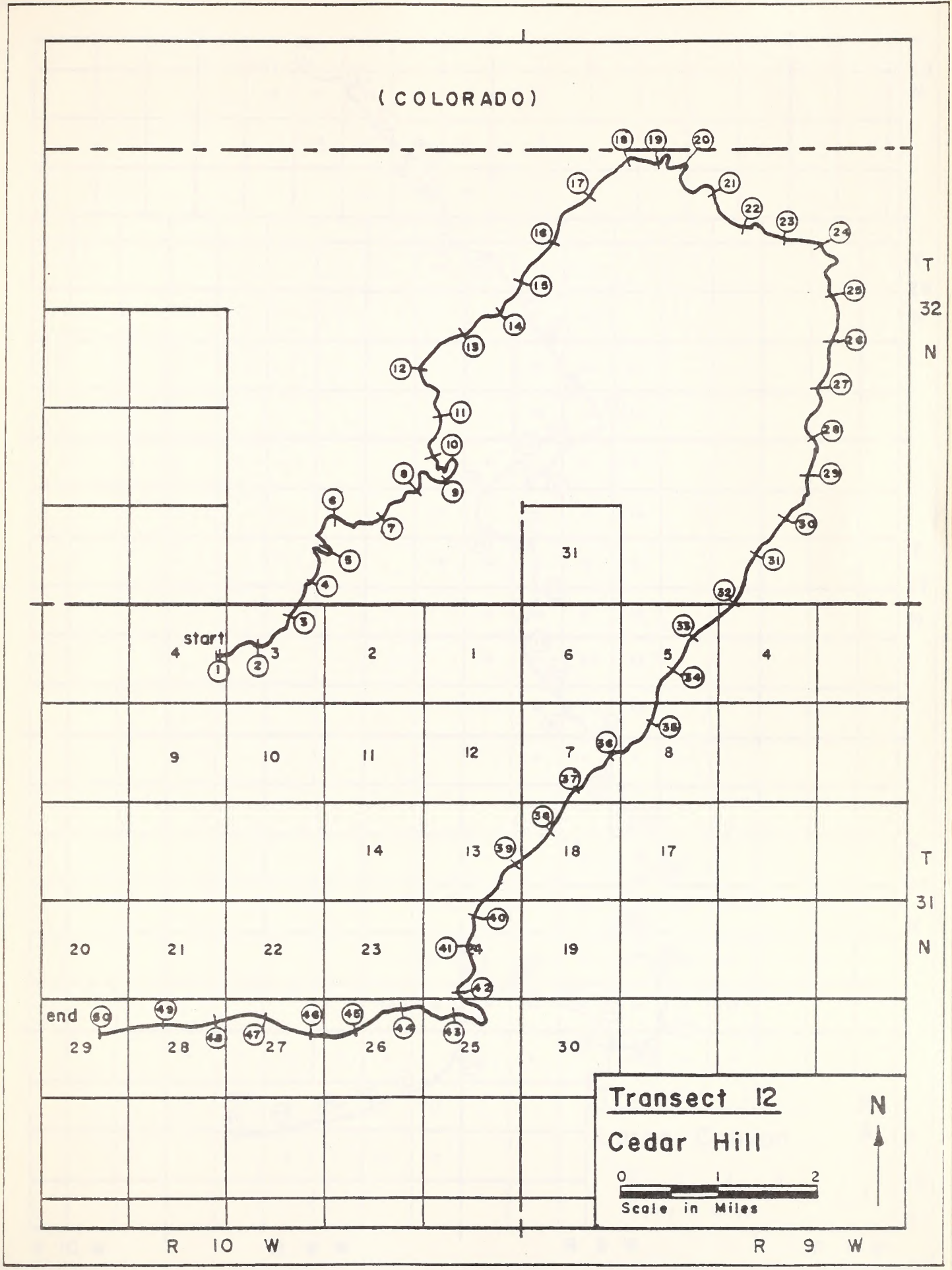

Transect 8
Hospah
N
0.5 0 1
Scale in Miles
start
end
T 18 N
T 17 N
R 8 W
R 7 W
31
32
33
34
6
5
4
3
2
1
7
8
9
10
12
7
8
16
15
14
13
18
17
22
23
24
19
20

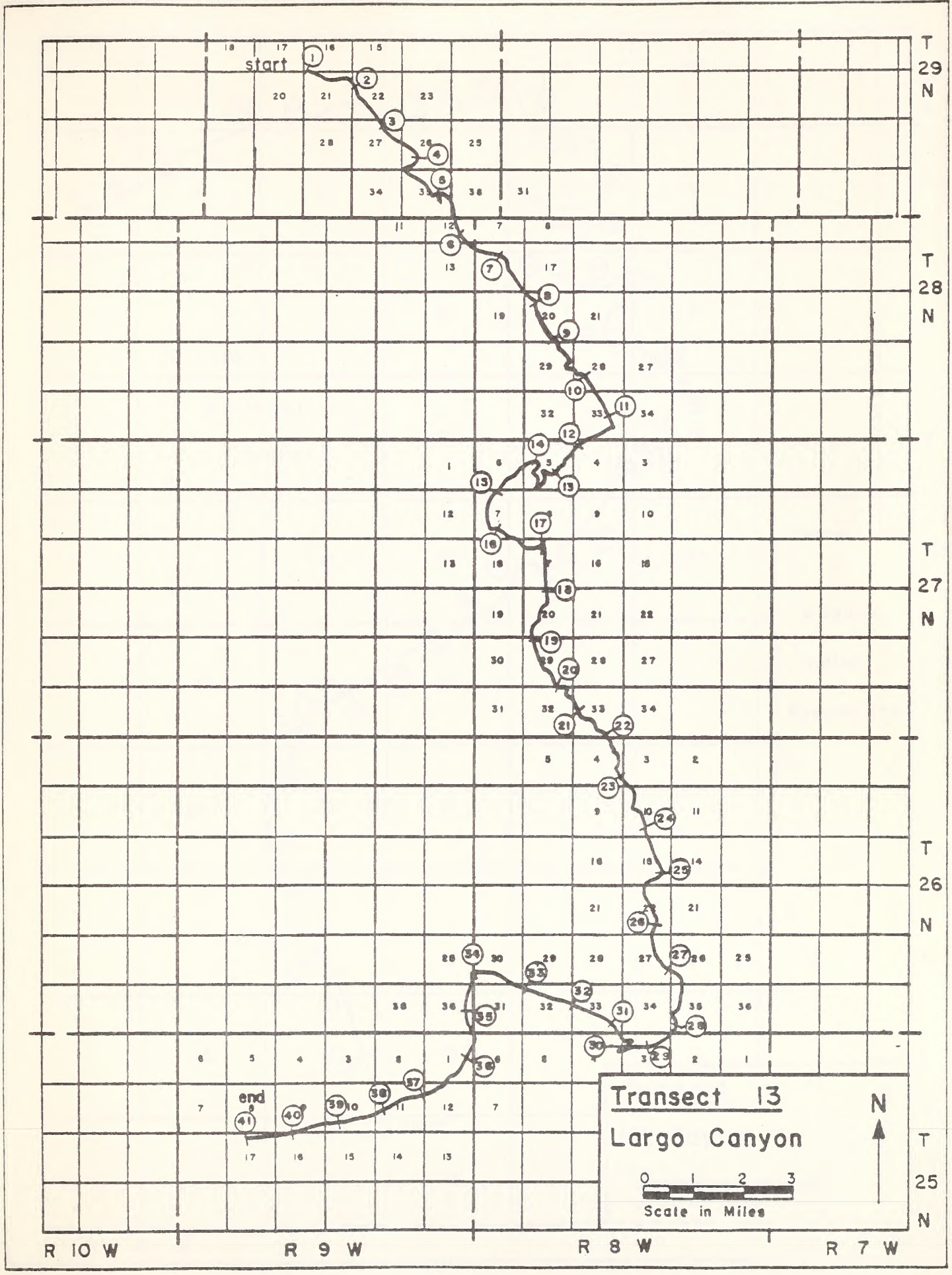

(Ute Mountain Indian Reservation)
start
end
Transect 9
Kirtland
0.5 0 1
Scale in Miles
N
T 30 N
R 15 W
R 14 W

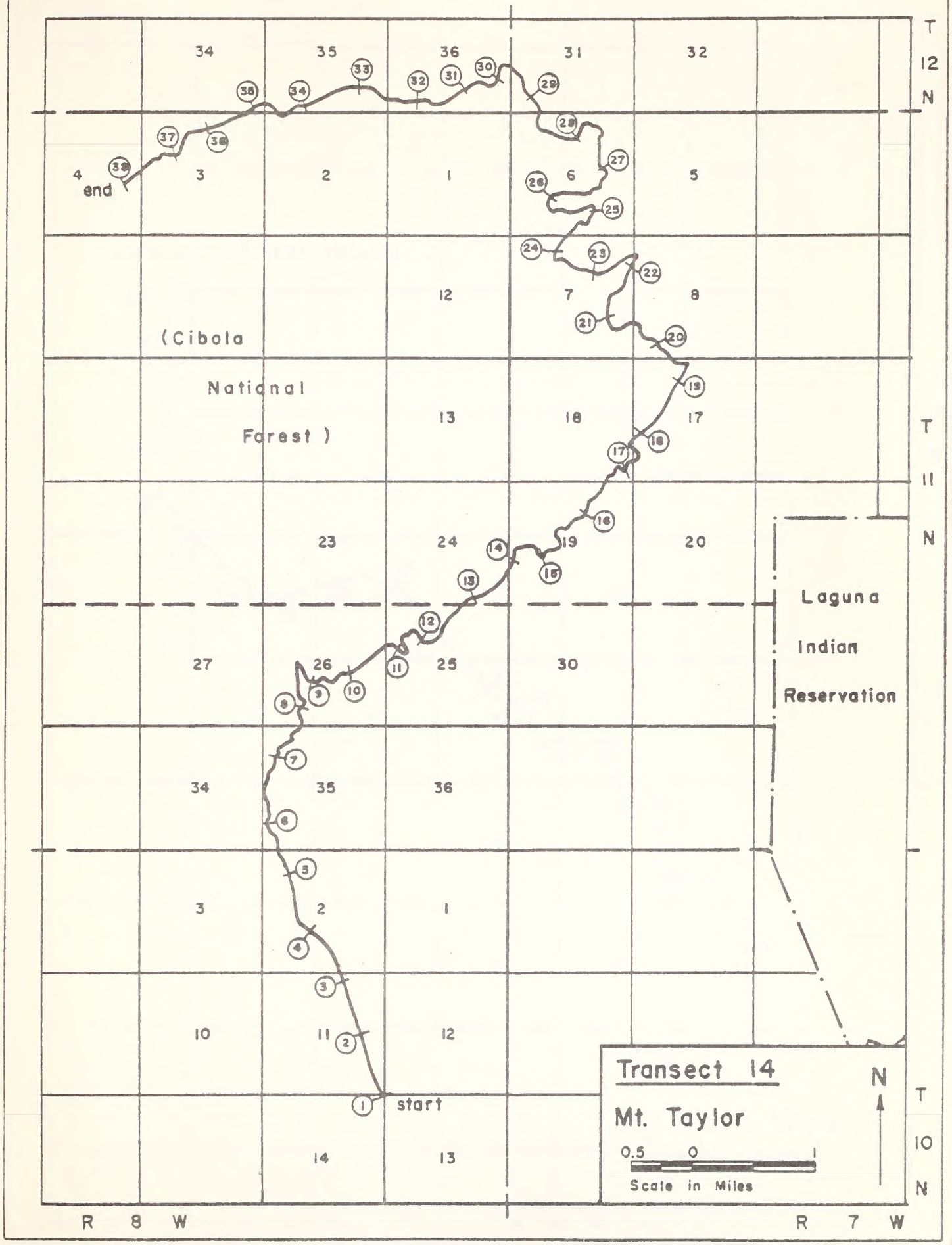

T 32 N
T 31 N
R 13 W
(Ute Mountain Indian Reservation)
start
end
Transect 10
La Plata
N
0.5 0 1
Scale in Miles

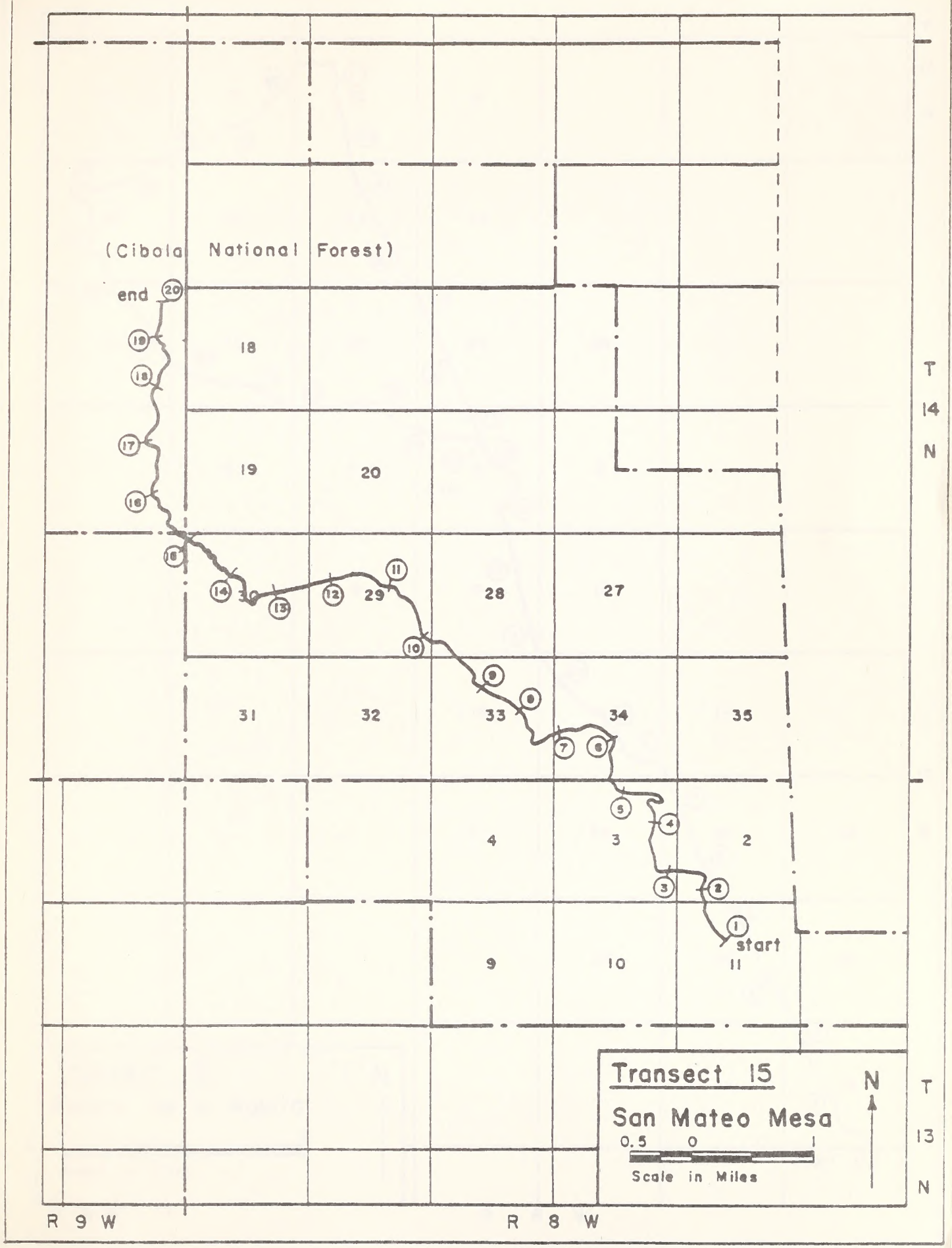
T-10

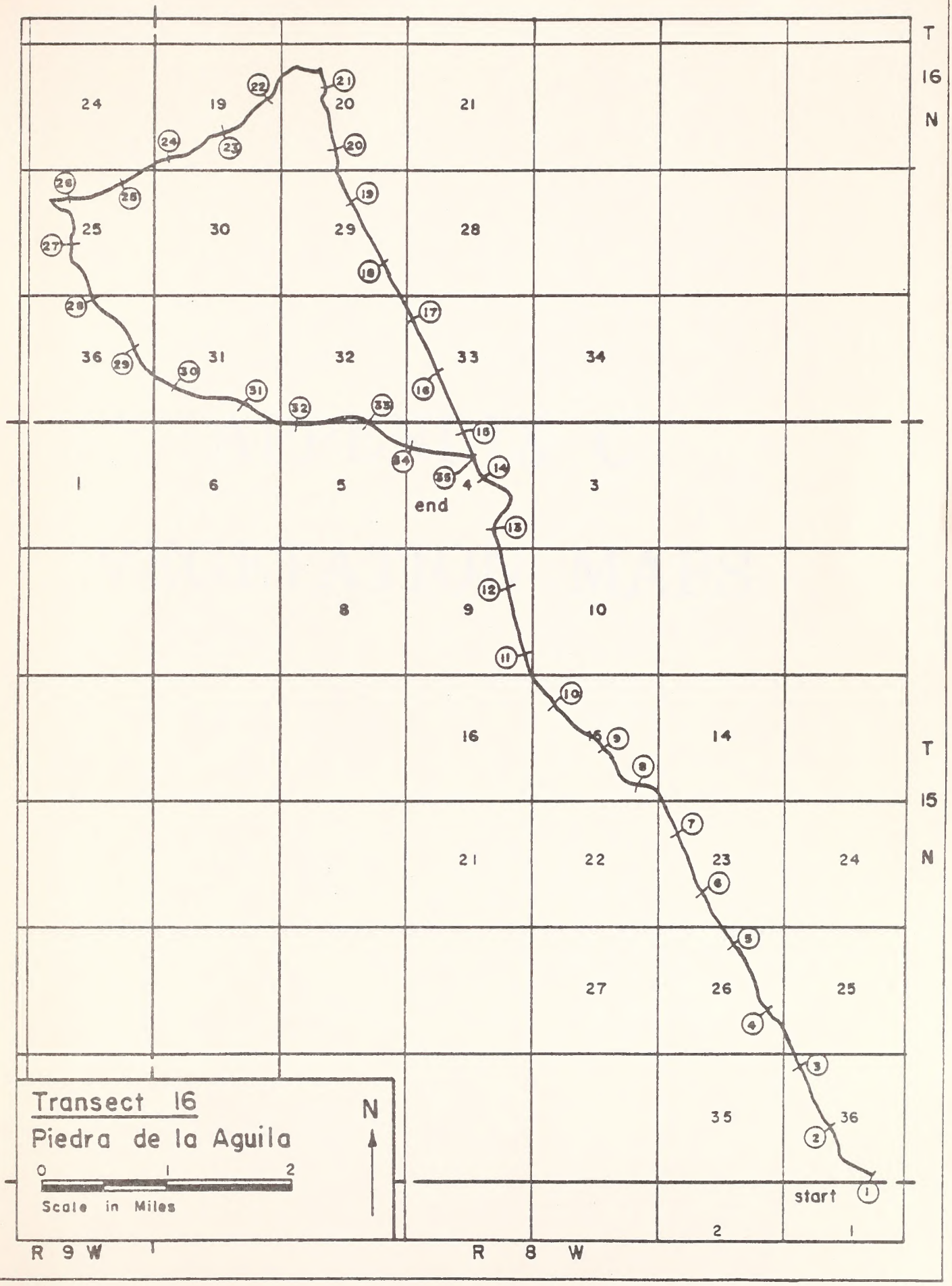

(COLORADO)
T 32 N
T 31 N
T 30 N
R 12 W
R 11 W
start
end
cont'd
cont'd
Transect 11
Flora Vista
0 1 2
Scale in Miles
N


(COLORADO)
T 32 N
T 31 N
R 10 W
R 9 W
start
end
Transect 12
Cedar Hill
N
0 1 2
Scale in Miles


start
end
Transect 13
Largo Canyon
N
0 1 2 3
Scale in Miles
T 29 N
T 28 N
T 27 N
T 26 N
T 25 N
R 10 W
R 9 W
R 8 W
R 7 W

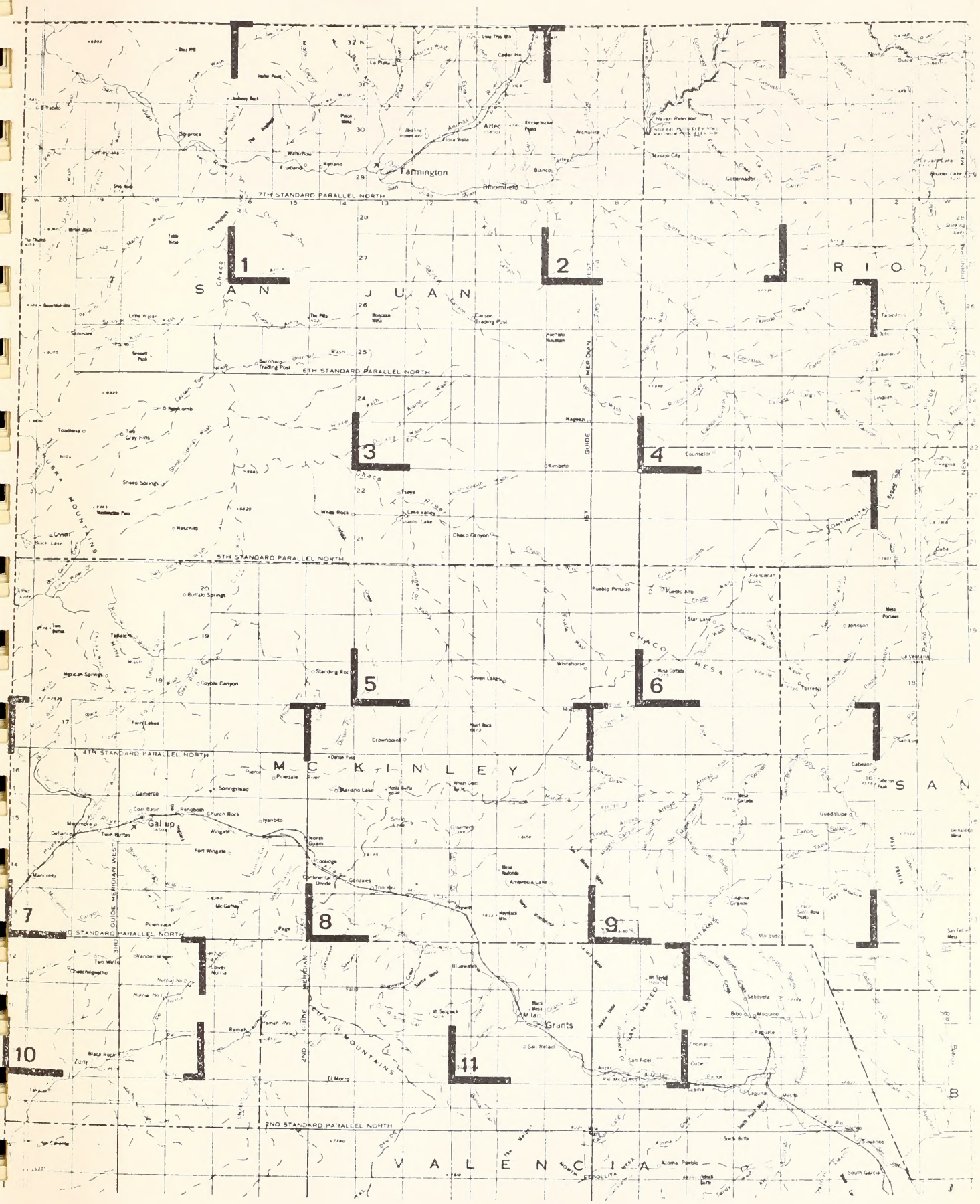

Transect 14
Mt. Taylor
0.5 0 1
Scale in Miles
N
start
end
(Cibola National Forest)
Laguna Indian Reservation
T 12 N
T 11 N
T 10 N
R 8 W
R 7 W


(Cibola National Forest)
end
start
18
19
20
28
27
31
32
33
34
35
4
3
2
9
10
11
T 14 N
T 13 N
R 9 W
R 8 W
Transect 15
San Mateo Mesa
0.5 0 1
Scale in Miles
N

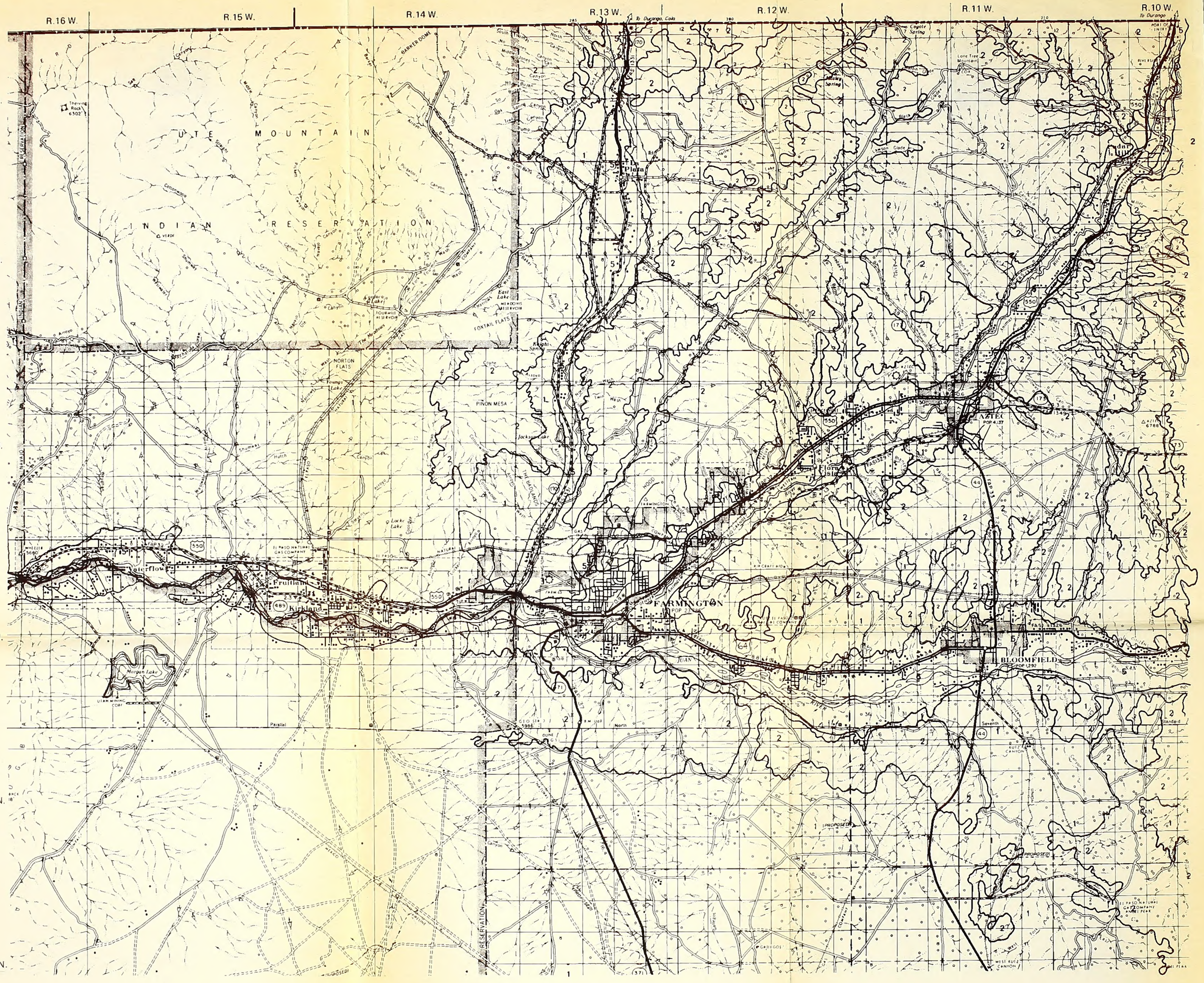

T 16 N
T 15 N
R 9 W
R 8 W
Transect 16
Piedra de la Aguila
N
0 1 2
Scale in Miles
start
end

APPENDIX C

VEGETATION MAPS



INDEX MAP
FOR
WILDLIFE VEGETATION MAPS



MILES

SCALE: 1:126720 ½″ = 1 MILE

VEGETATION

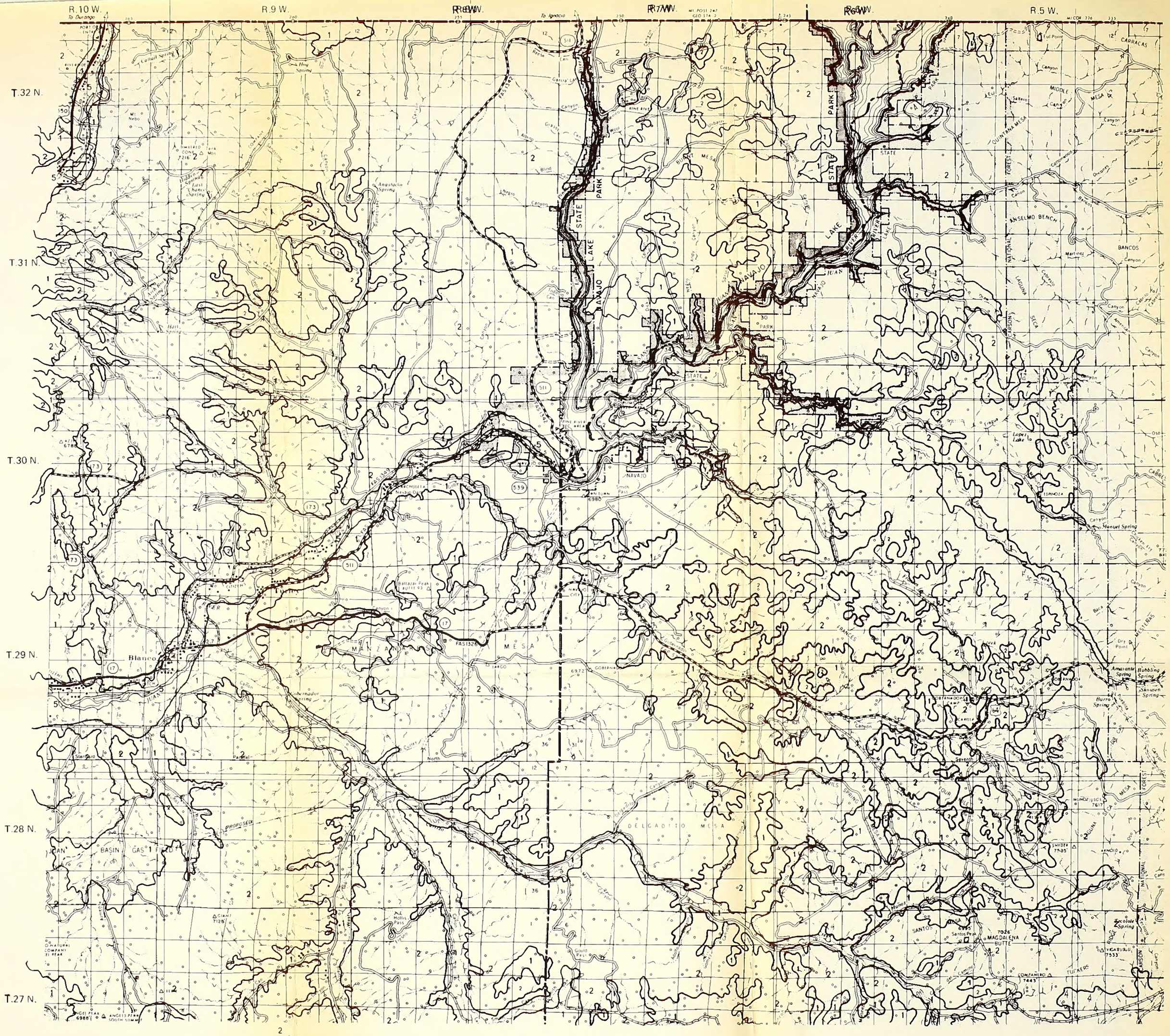
1. Grassland/Desert Shrub/Barren
2. Piñon-Juniper Woodland
3. Ponderosa Forest
4. Spruce-Fir Forest
5. Riparian

Vegetation delineations performed for Bureau of Land Management by Technology Application Center at University of New Mexico under contract with U.S. Fish and Wildlife Service

compiled 1977 at TAC by Denise Glore and Gordon Venable

Data base BLM color photography 1973, supplemented by U.S. Forest Service photography

Map base: New Mexico State Highway Dept. General Highway Maps



MILES

SCALE: 1:126720 ½″ = 1 MILE

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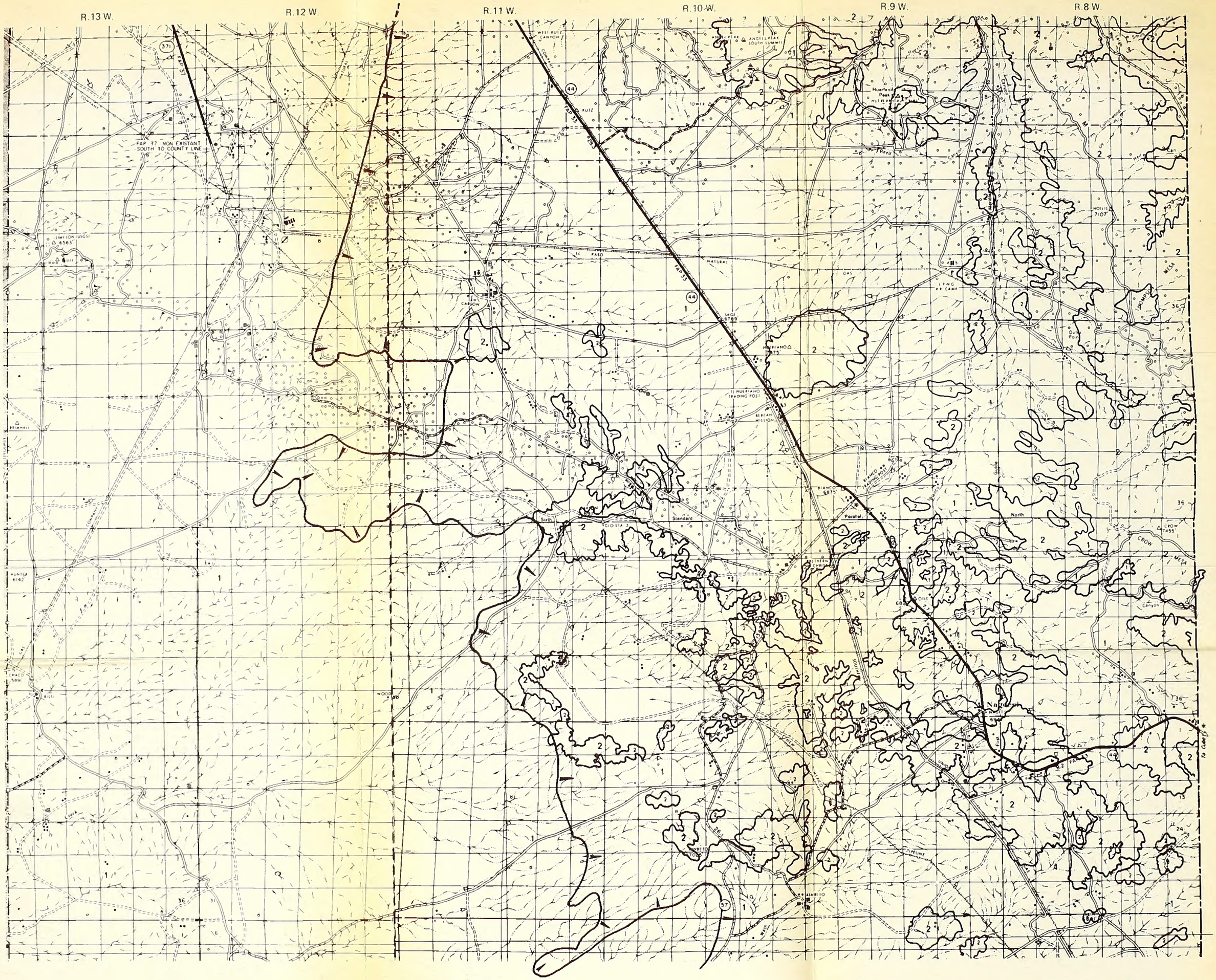

Sage Line — As Defined By B.L.M.

VEGETATION

1. Grassland/Desert Shrub/Barren
2. Piñon-Juniper Woodland
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5. Riparian

MILES

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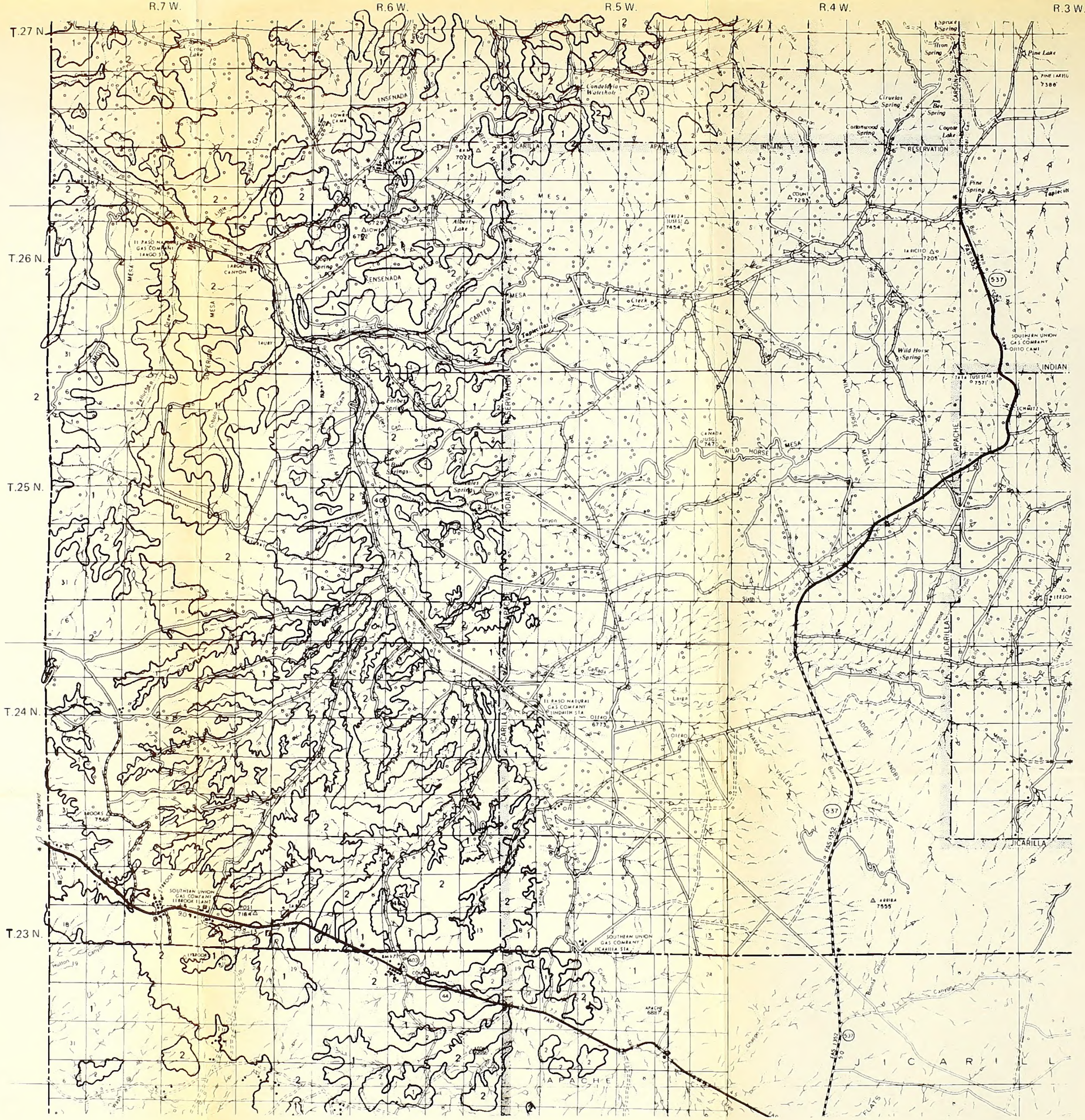

VEGETATION

1. Grassland/Desert Shrub/Barren
2. Piñon-Juniper Woodland
3. Ponderosa Forest
4. Spruce-Fir Forest
5. Riparian

1 ½ 0 1 2 3 4 MILES

SCALE: 1:126720 ½″ = 1 MILE

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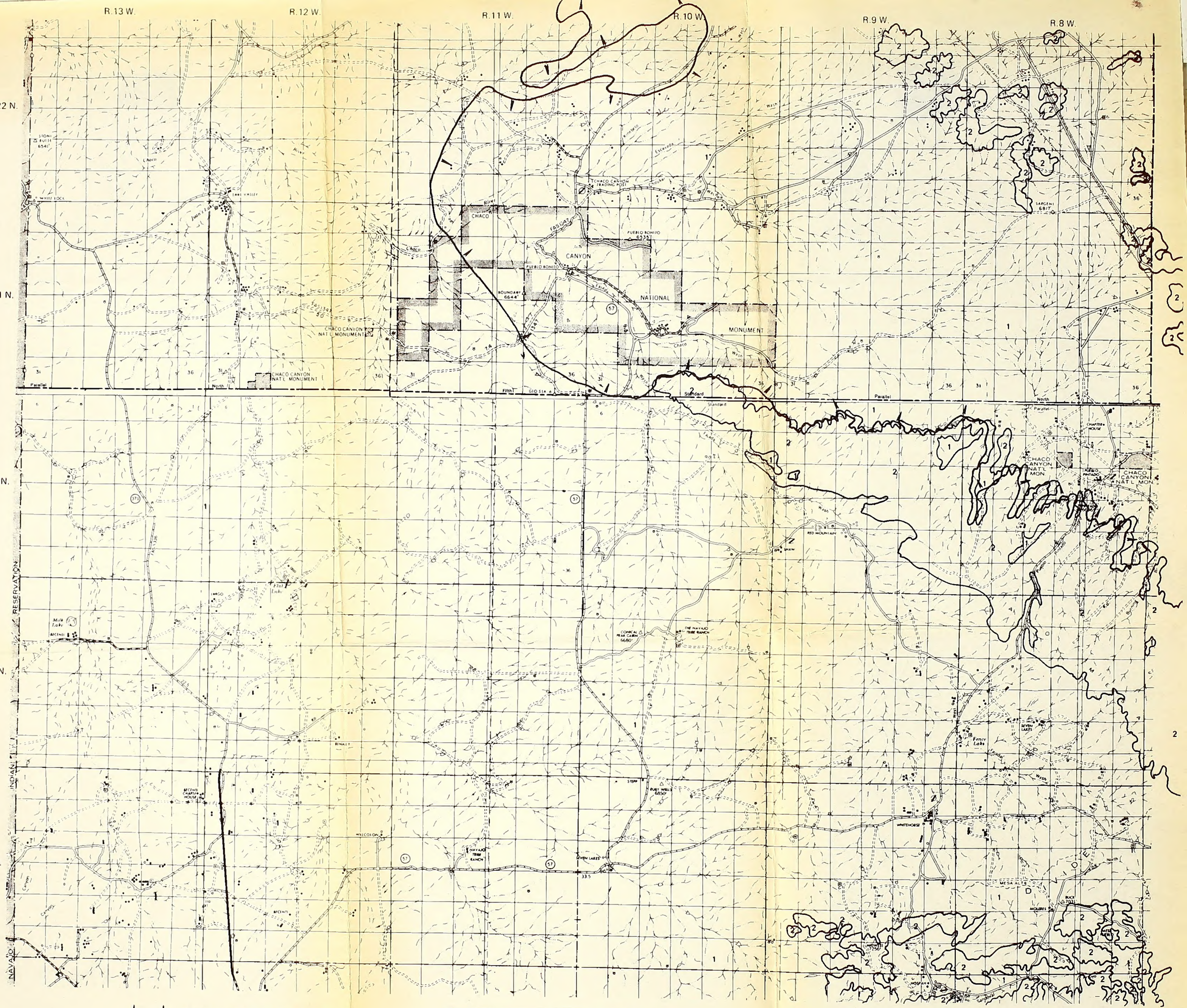

Sage Line – As Defined By B.L.M.

VEGETATION

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4. Spruce-Fir Forest
5. Riparian

1 ½ 0 1 2 3 4 **MILES**

SCALE: 1:126720 ½″ = 1 MILE

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1 ½ 0 1 2 3 4 **MILES**

SCALE: 1:126720 ½″ = 1 MILE

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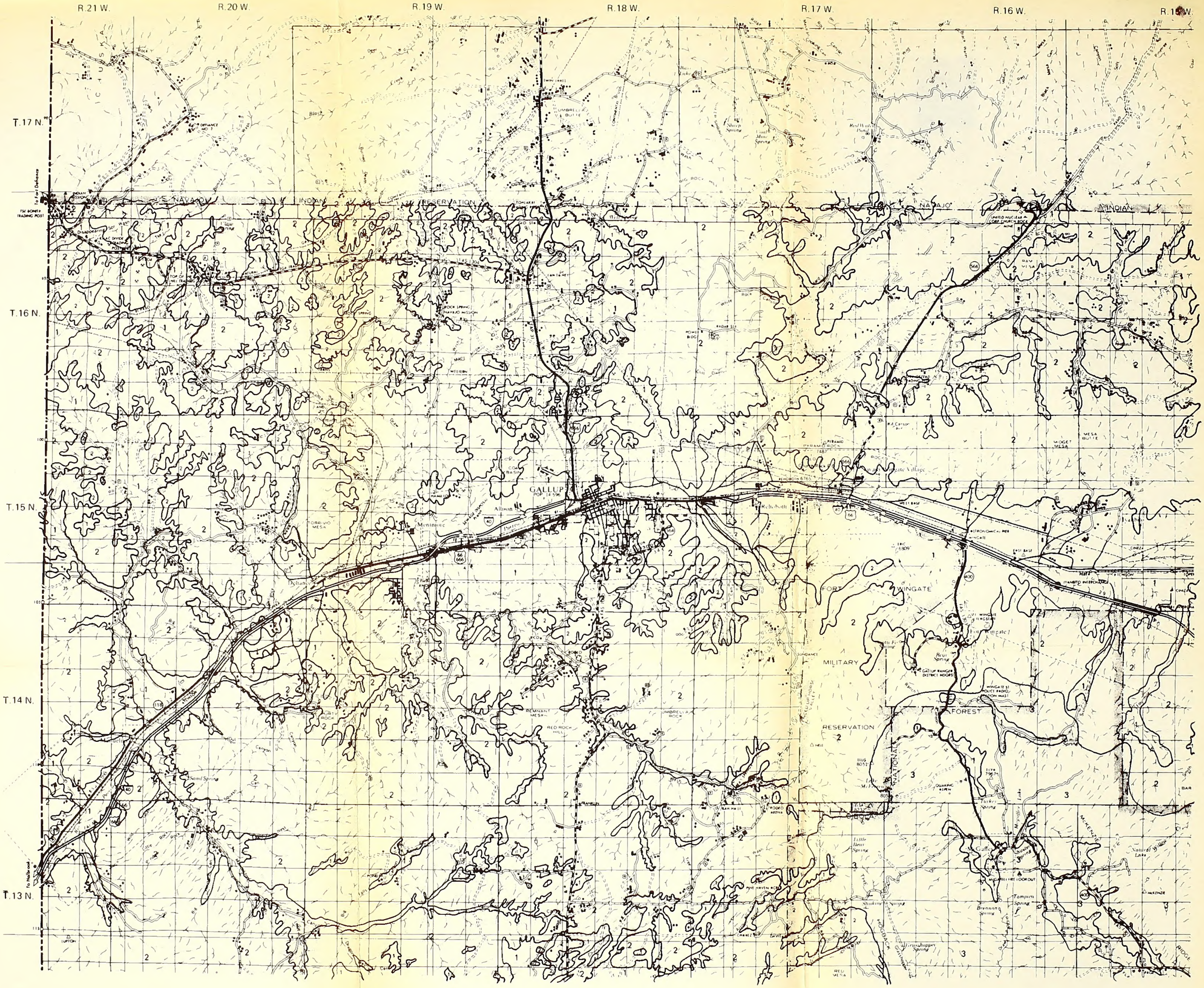

MILES

SCALE: 1:126720 ½″ = 1 MILE

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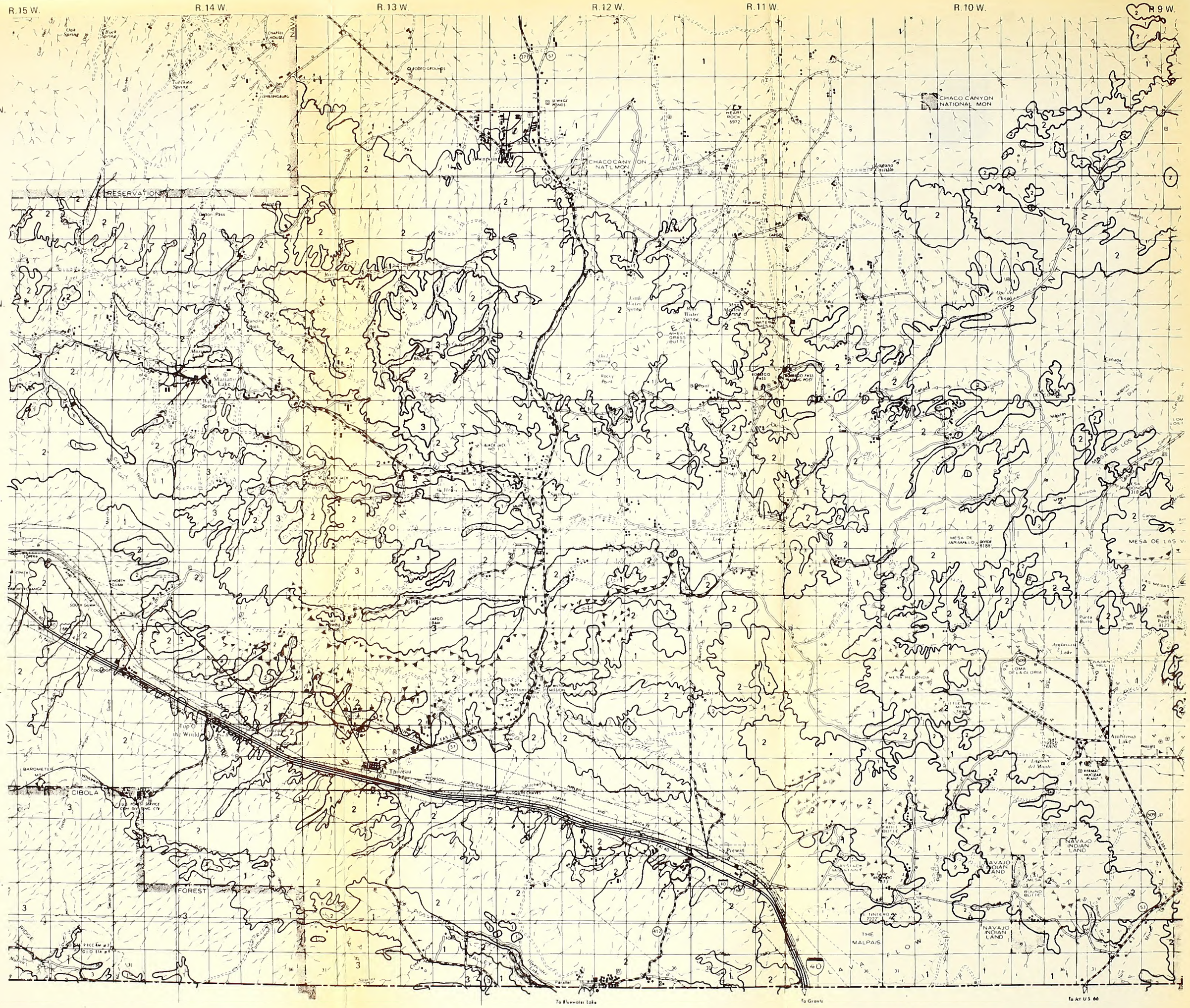

1 ½ 0 1 2 3 4 MILES

SCALE: 1:126720 ½" = 1 MILE

VEGETATION

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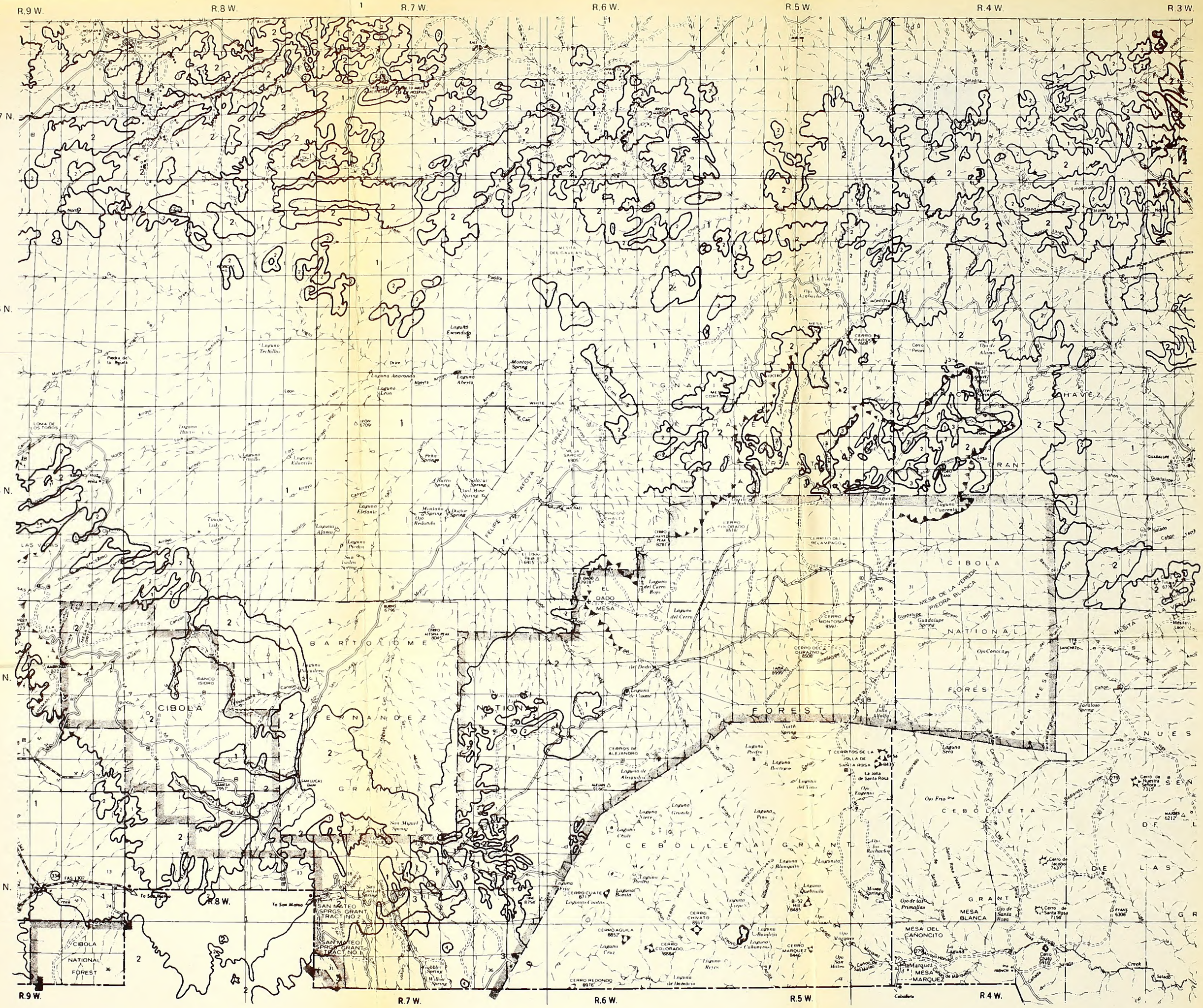

1 ½ 0 1 2 3 4 MILES

SCALE: 1:126720 ½″ = 1 MILE

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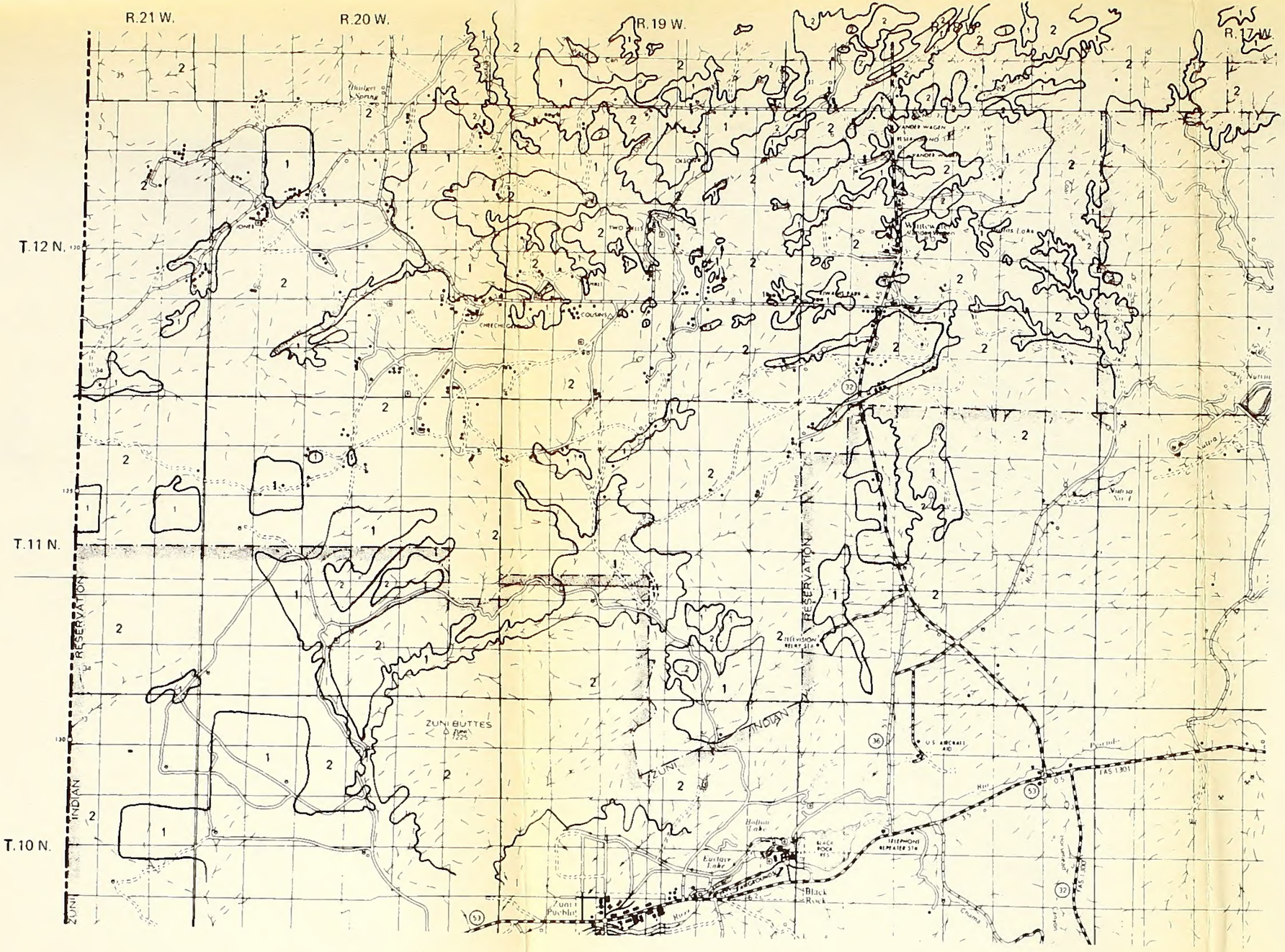

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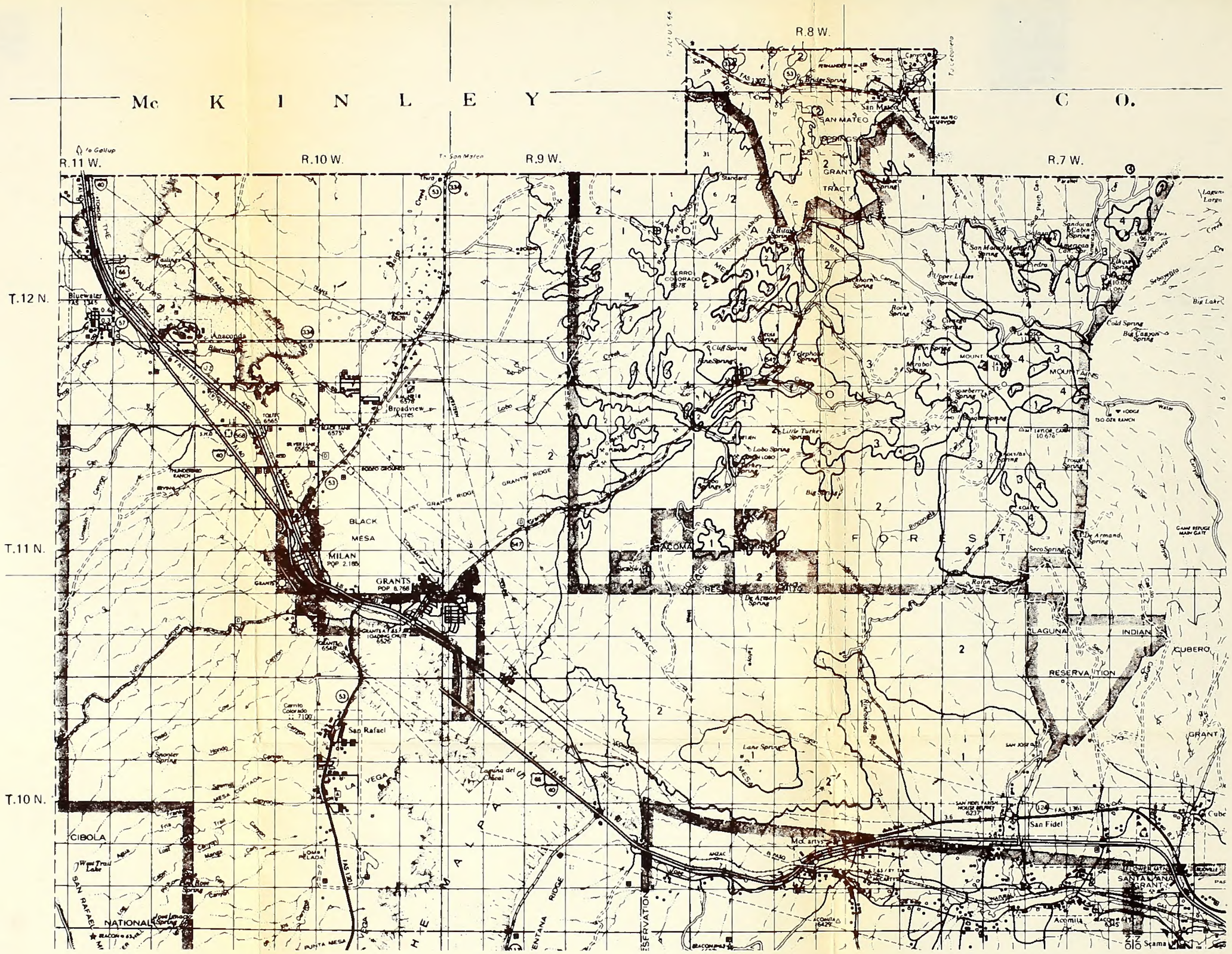

VEGETATION

1 Grassland/Desert Shrub/Barren

2 Piñon-Juniper Woodland

3 Ponderosa Forest

4 Spruce-Fir Forest

5 Riparian

1 ½ 0 1 2 3 4 MILES

SCALE: 1:126720 ½″ = 1 MILE

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Borrower's Car

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coal lease a

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Date Loaned	Borrower